

Scientific Research Institutions

Under the
Government of India

By
Ved Prakash

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Indian Institute of Public Administration
New Delhi-1.

SCIENTIFIC RESEARCH INSTITUTIONS UNDER THE
GOVERNMENT OF INDIA

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F o r e w o r d

In the present age of science, it is but natural that the Governments today are taking increasing interest in the promotion of science and its utilisation for achieving various national, social and economic, objectives. The problems in this regard are mainly twofold viz., formulation of a coherent policy for science and technology and chalking out and implementation of programmes designed to achieve various goals.

Science policy has, indeed assumed an important place in the expanding field of public administration. Its significance has now been fully recognised by scientists, **teachers** and public officials and more and more institutions and individual scholars are getting involved in the study and teaching of this subject, particularly in the more advanced countries.

In India, however, science policy still remains a new subject of study. It has yet to receive the recognition due to it from the Government, universities or research organisations in the country. Correspondingly, the available information and literature on science policy in India remains quite limited.

The Indian Institute of Public Administration initiated work in this area of study in 1966 while undertaking some studies for the Administrative Reforms Commission. The limitations of available literature and information on the subject was evident during the course of this work. The Institute is trying to fill in this vacuum to the extent possible.

The first attempt of the Institute in this direction was the preparation and publication of an annotated bibliography on 'Organisation and Management of Scientific Research'. It has now prepared the volume on 'Scientific Research Institutions under the Government of India', which gives a brief description of the organisation, aims and achievements of the various research organisations under the Government of India. In Part I of the volume is included an analytical account of some of the organisational aspects of these research organisation. It is hoped that the publication will be found useful as source material and basic work for further research in this area.

I am thankful to Mr. Ved Prakash for preparing this volume. He has done some pioneering work in the science policy study area. Shri N.H. Atthreya,

(iii)

Director, Modern Management Counsel, has been the honorary project director for the science policy studies taken up by the Institute for the Administrative Reforms Commission. His contribution has been valuable and he deserves the gratitude of the Institute for his efforts.

June 1968.

(J.N. Khosla)

PART ONE

Scientific Research Institutions under the
Government of India - an analysis.

Scientific Research Institutions Under
the Government of India: An Analysis.

" The key to national prosperity, apart from the spirit of the people, lies, in the modern age, in the effective combination of three factors, technology, raw materials and capital, of which the first is perhaps the most important, since the creation and adoption of new scientific techniques can, in fact, make up for a deficiency in natural resources, and reduces the demand on capital. But technology can only grow out of the study of science and its application".¹

By thus stating the role of science and technology in the present age, the Government of India also indicated its desire to bring about the economic development and social-welfare in the country by effective use of science and technology. To achieve the end result, a large number of organisations in various areas of scientific research have been established by the Government. It is also making increasing investment towards this effort and taking other suitable steps

1. Scientific Policy Resolution of the Government of India, March 4, 1958.

to stimulate economic utilisation of scientific research.²

The detailed description of the activities and achievements of various research organisations, as included in the *Volume*, gives an idea of the effort made, so far, by the Government of India in the field of scientific research. Almost all the organisations engaged mainly on scientific research are covered in this volume. In some executive agencies of the Government of India, responsible for science - oriented functions, there exist units which undertake research pertaining to these functions. Such units have, however, been excluded from this volume.

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2. The increasing financial involvement Government of India is indicated by the figures of total expenditure on scientific research, which are Rs.46.850 million in 1950-51, Rs.83.641 million in 1953-54, Rs.121.380 million in 1955-56, Rs.220.782 million in 1958-59, Rs.299.223 million in 1960-61, Rs.486.561 million in 1963-64, Rs.586.070 million in 1964-65 Rs.586.070 million in 1966-67.

Thus, there are 117 organisations under the Government of India, which are mainly engaged on scientific research and which have been described in this ~~volumes~~. The Ministry - wise distribution of these organisations is as follows:-

(a) Ministry of Education	34
(b) Ministry of Food, Agriculture, Community Development and Co-operation.	34
(c) Ministry of Defence.	27
(d) Ministry of Health, Family Planning and Urban Development.	12
(e) Department of Atomic Energy.	5
(f) Ministry of Irrigation and Power.	3
(g) Ministry of Railways.	1
(h) Ministry of Steel, Mines and Metals.	1

It would, therefore, be seen that major scientific research effort of the Government of India has been in five fields, viz., atomic energy, defence equipment, agriculture, industry and medicine. The number of research organisation in these five fields is 112 out of a total of 117 under the Government of India. In terms of finances, the total annual expenditure on research organisation in these five fields exceed Rs. 467.360 million, which is about 80% of the total money spent annually by Government of India on scientific research.³

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3. These figures pertain to the year 1964-65. The expenditure figures according to controlling Ministries are: Atomic Energy Department Rs.143.417 million; Defence Ministry Rs.79.394 million; Education Ministry Rs.136.166 million; Food and Agriculture Ministry Rs. 77.412 million; and Health Ministry Rs. 30.971 million.

The years of establishment of these scientific research organisations make an interesting reading. Survey of India, Dehradun was the first organisation to be set up in 1767. Two other survey organisations, viz., Botanical Survey of India and the Archaeological Survey of India were the next to follow in 1890 and 1892 respectively. During the period 1900 - 1947, another 19 scientific research organisations were established. Thus, at the time when India attained freedom there were only 22 scientific research organisations in existence. Of these 22 organisations, six were engaged on survey work, ten on agriculture research, five on medical research and one on problems of irrigation and power. Surprisingly, not a single organisation, except C.S.I.R. itself was set up during this period to undertake industrial research. C.S.I.R., established in 1942, was mostly occupied till 1945, with urgent problems of War importance. The Council had at that time only two laboratories directly under its control.

The progress of establishment of scientific research organisations after Independences is indicated by the following table:

Establishment of Scientific Research Organisations⁴

Years	Number
Before Independence	23
1947-1951	15
1952-1956	27
1957-1961	13
1962-1966	13
1967	nil

It would thus be seen that vigorous efforts for undertaking research work in different areas of science have been made after Independence. Two areas, which got major support from this effort, have been industrial and atomic research. In terms of Plan periods, second five years Plan provided maximum boost to the scientific research activity. The later efforts have been consistent, except that financial stringency during last five years had also an impact on this activity. Only two new scientific research organisations have been established since 1964.

4. Defence research organisations are not included in this generalised statement.

The 117 research organisations described in this brochure are scattered all over the country. The location of a laboratory at a particular place is mostly on account of advantages available at that place. But it is difficult to generalise. Some laboratories have been located at places, where apparently no such benefits are available.

But most of these research organisations are located in big cities. The following table gives the names of the cities where three or more than three laboratories are located:-

Calcutta.	13
Delhi.	13
Hyderabad.	7
Poona.	7
Bangalore.	5
Dehradun.	5
Madras.	4
Bombay.	3
Chandigarh.	3

It can thus be inferred that notwithstanding the difficulties in getting necessary physical facilities, there is a tendency to establish new organisation in the Capital of the country or in other big cities. But location of a very small number of research organisations

at Bombay and Madras affirm the view that there is no set criteria for the location of a research laboratory at one place or the other.

The same position is selected in the location of scientific research organisations in various states of India. A small state like Kerala has 6 research organisations in its territory whereas a big state (both in area and population) like Bihar has 4 and Madhya Pradesh none. But the case of Punjab provides best example for lack of any fixed basis for location of research organisation. This state which is well ahead of most of the other states in industry, agriculture and irrigation do not have even a single research organisation located in its territory. The table given below shows the distribution of research laboratories in various States of India:-

Scientific Research Organisations
located in various State of India:

Uttar Pradesh.	20
West Bengal.	16
Maharashtra.	12
Madras.	9
Mysore.	9
Andhra Pradesh.	8
Kerala.	6

Rajasthan.	5
Bihar.	4
Gujarat.	4
Orissa.	3
Assam.	1
Haryana.	1
Jammu & Kashmir.	1
Madhya Pradesh.	nil
Nagaland.	nil
Punjab.	nil

Union Territories

Delhi.	13
Chandigarh.	3
Himachal Pradesh.	2
Total.	117

The study of the functions of these scientific research organisation show that, by and large, these institutions have distinct area of activity. There are only a few instances of similar type of research work being undertaken in different laboratories.⁵ And these exceptions can be justified on various grounds.

5. For example, research work in solid state physics or geophysics is done at more than one research organisation.

Similarly, the Ministries of the Government of India and various research Councils have under them research organisation in the specific areas of their responsibility. For example, the research organisations in Department of Atomic Energy, Ministry of Defence and Indian Council of Medical Research are respectively responsible for research in the field of atomic energy, defence equipment and medicine. The Council of Scientific and Industrial Research is the only exception in this respect and the research activities of the national laboratories under it extend to various fields like industry, medicine, public health, geophysics, aviation, etc. But this wide coverage by National laboratories is justified on the ground that CSIR is made responsible not only for industrial research but for scientific research itself.

The placement of these scientific research organisations under various agencies of the Government presents a varied pattern. Of the 117 organisations as many as 63 are under the following three research councils:-

- | | | |
|-------|--|----|
| (i) | Indian Council of Agricultural Research. | 30 |
| (ii) | Council of Scientific and Industrial Research. | 28 |
| (iii) | Indian Council of Medical Research. | 5 |

These councils, though fully financed by the Government of India, are autonomous bodies, registered under the Societies Registration Act. Establishment of a large number of research organisations outside the direct control of the Ministries has been done with a view to allow to the scientific institutions freedom from Government rules and procedures, which are inappropriate to their effective functioning. But how far these councils have made full use of this autonomy is a different question.

In turn, these Councils accord autonomy to the laboratories under them which varies greatly. The laboratories under C.S.I.R., with their own Executive Councils, enjoy more freedom in working than the laboratories under the other two Councils.

The atomic energy research units are all under the Department of Atomic Energy. The Department has got a special and unique administrative set up and procedures which confer on it considerable autonomy. The Atomic Energy Commission under the Department enjoys full authority to plan and implement a programme of atomic energy development on sound technical and economic principles. The Commission has powers of the Government of India, both administrative and financial, within the limits of the budget provision allotted by the Parliament.

The remaining scientific research institutions, including those under the Ministry of Defence, are all departmental units and follow normal government rules and regulations.

The internal organisation of these research laboratories does not differ much from one another. Most of the laboratories are organised in basic research disciplines. Only a few laboratories are organised in project teams. Some others follow a middle approach, in the sense that they are organised discipline-wise but work on project team basis.

There are 5 research organisations which are organised in more than 16 technical divisions. These are - Geological Survey of India (30), Bhabha Atomic Research Centre (23), Central Water and Power Research Institute (2), National Physical Laboratory (18) and Central Drug Research Institute (17).

The categorisation of the laboratories* on the basis of number of technical divisions is as follows:-

* Excluding the defence research laboratories and three other organisations, viz. Archaeological Survey of India, National Metallurgical Laboratory and Tuberculosis Chemotherapy Centre; information about these organisations was not available.

27	Laboratories (31.0%)	have	1-4	Technical Divisions
33	" (37.9%)	"	5-8	" "
14	" (16.1%)	"	9-12	" "
8	" (9.2%)	"	13-16	" "
5	" (5.7%)	"	more than 17	Tech.Divisions

Further breakdown of the research institutions according to the number of technical division in which these are organised is as follows:

No. of Research Institutions	No. of Technical Division in the Institutions.
13	5
12	4
10	3
9	7
8	6
6	9
4	10
3	1
3	8
3	14
2	2
2	11
2	12
2	13
2	16
1	15

In addition to the technical divisions each laboratory has 3 or 4 service divisions dealing with one or more of the following subjects:

Administration and Accounts.

Purchase and Stores.

Statistics.

Operational Research.

Library and Technical Information.

Liaison.

Extension.

The idea of having a well staffed information unit, responsible for making the requisite information about the research work reaches the user, is gaining momentum and this practice is now being followed by most of the big research institutions.

The laboratories covered in this brochure are both big and small, in terms of financial inputs and staff employed. The figures of staff at these institutions* show that on the one hand there are 15 institutions employing less than 50 persons and on the other there

* Excluding 27 defence research laboratories and the Thumba Equatorial Rocket launching Station, Trivandrum; information from these institutions was not available.

are 7 institutions with more than 1000 employees on their rolls. The smallest number of employees in a scientific research organisation is 8 (in Indian Registry of Pathology) and the largest number is more than 25000 persons (in Survey of India).

The total staff strength in all these research organisations is 67960. The Survey of India is the largest organisation in respect of staff strength, employing 25525 persons. It is followed by Bhabha Atomic Research Centre (8545 employees), Geological Survey of India (5740 employees), Archaeological Survey of India (2929 employees), Railway Research Designs and Standards Organisation (1689 employees), Indian Agricultural Research Institute (1626 employees) and Indian Veterinary Research Institute (1157 employees). The staff strength in the remaining research organisations is as follows:

1	organisation with staff strength between	901-1000
1	"	801- 900
1	"	701- 800
6	"	601- 700
6	"	501- 600
1	"	401- 500
11	"	301- 400
12	"	201- 300
14	"	101- 200
14	"	51- 100
15	"	upto 50

In terms of percentages, 16.8% of the institutions have staff strength upto 50 persons, 15.7% have between 51 to 100 employees, 15.7% have between 101 to 200 employees, 13.5% have between 201 to 300 employees, 12.3% have between 301 to 400 employees, 1.1% have between 401 to 500 employees, 6.7% have between 501 to 600 employees, 6.7% have between 601 to 700 employees, and 11.3% have more than 700 employees.

The strength of staff Ministry-wise* is given in the following table:

Ministry/Department	Total strength of staff.
i. Atomic Energy Department.	9238 (13.7%)
ii. Ministry of Education.	40514 (59.6%)
iii. Ministry of Food, Agriculture, Community Development and Co-operation.	8351 (12.3%)
iv. Ministry of Health, Family Planning and Urban Development.	1345 (2.4%)
v. Ministry of Irrigation & Power.	783 (1.1%)
vi. Ministry of Railways.	1689 (2.5%)
vii. Ministry of Steel, Mines and Metals.	5740 (8.4%)
Total	67960 (100%)

* This includes Councils under the administrative control of various Ministries.

These figures indicate that more than 74% of the organisations, 66 out of 89, have staff strength upto 400 persons. It is only in about one-fourth of the Institutions that the staff number exceeds 400. Thus, a large number of scientific research institutions are small units. Comparatively the research institutions under the Ministry of Education are larger units than under other Ministries. Of the 34 institutions under it (including 28 C.S.I.R. laboratories), as many as 14 (41.2%) have staff exceeding 400. In absolute numbers also, the Ministry of Education accounts for about 60% of the total staff employed on scientific research.

The staff in these research organisations is divided in three main groups, viz., scientists and technologists, auxiliary technical, and administrative. The total strength of staff under these three categories in the scientific research institutions described in the brochure* is as follows:

Scientists and Technologists.	13721 (35.2%)
Auxiliary Technical Staff.	15402 (39.6%)
Administrative Staff.	9813 (25.2%)
Total.	38936 (100%)

* Excluding the defence research laboratories and 4 other institutions viz., Thumba Equatorial Rocket launching Station, Survey of India, Archaeological Survey of India (Total staff 25525). All India Institute of Hygiene and Public Health (Total staff 570) necessary information from these organisation was not available.

The figures of staff also indicate that scientists and technologists exceed the auxiliary technical staff only in 29 institution (33.7%) and they equal each other in 2 institutions (2.3%). In the remaining 55 institutions (64.7%) the auxiliary technical staff out numbers the scientists and technologists.

Similary, the combined strength of scientists and technologists and auxiliary technical staff equals the administrative staff in one institution, viz., Experimental Satellite Communications Earth Station and exceeds in the remaining, except 4 institutions. These four institutions where administrative staff exceeds the technical staff are: National Sugar Institute, Indian Veterinary Research Institute, Indian Grassland and Fodder Research Institute and the National Institute of Communicable Diseases. But on the whole the ratio between scientific and technical staff (including auxiliary technical), and the administrative staff is 75: 25 i.e., 3: 1.

The ratio between scientists and technologists, and auxiliary technical staff is maximum i.e., 85:2, at the Central Inland Fisheries Research Institution and minimum i.e., 1:9 at the Central Coconut Research

Station and the Indian Institute of Sugarcane Research. Similarly, the ratio between the scientific and technical staff (including the auxiliary technical staff) and the administrative staff is maximum, i.e., 18:1, at the National Atlas Organisation and minimum, i.e., 1:2 at the National Institute of Communicable Diseases.

The Ministry-wise distribution of staff under various categories is given in the following table:

	S.T.	A.T.	A.D.	Total
Department of Atomic Energy.	5751(62.2%)	1690(18.3%)	1797(19.4%)	9238(100%)
Ministry of Education.	2905(24.1%)	6413(53.2%)	2742(22.7%)	12060(100%)
Ministry of Food, Agriculture, Community Development & Co-operation.	3239(38.87%)	2503(29.9%)	2609(31.2%)	8351(100%)
Ministry of Health, Family Planning and Urban Development.	260(24.29%)	485(45.1%)	330(30.71%)	1075(100%)
Ministry of Irrigation and Power.	206(26.3%)	320(40.5%)	257(32.8%)	783(100%)
Ministry of Railways.	173(10.2%)	1099(65.1%)	417(24.6%)	5740(100%)
Ministry of Steel, Mines and Metal.	1187(20.7%)	2892(50.4%)	1661(28.9%)	5740(100%)

The above figures indicate that the Department of Atomic Energy has largest number of scientists and technologists (5751) employed in its research units

than any other Ministry. The auxiliary technical staff is, however, small at atomic energy units, the figure stands at two-seventh of the strength of 1690, which is only scientists and technologists in these units.

The number of auxiliary technical staff is largest in research units under the Ministry of Education; 6413 persons (more than 53%) are holding auxiliary technicians' jobs in these units. The strength of auxiliary technical staff is one of the indicators to show the extent of interest in applied research and development work, and on this criteria the research institutes under Ministry of education are concentrating on applied work more than institutions in other Ministries.

The following table gives the strength of staff under different categories in the scientific research institutions under the Government of India.

Institution

Strength of Staff

I Department of Atomic Energy

	S.T.*	A.T.*	A.D.*	Total
Bhabha Atomic Research Centre, Trombay.	5318(62.2%)	1546(18.1%)	1681(19.7%)	8545 (100%)
Thumba Equatorial Rocket Launching Station, Trivandrum.	-	(Information not available)		
Physical Research Laboratory, Ahmedabad-9.	192(73.2%)	30(11.4%)	40(15.3%)	262 (100%)
Experimental Satellite Communications, Earth Station, Ahmedabad.	13(17.5%)	24(32.4%)	37(50.0%)	74 (100%)
Saha Institute of Nuclear Physics, Calcutta.	228(63.9%)	90(25.2%)	39(10.9%)	357 (100%)
Sub-Total.	5751(62.2%)	1690(18.3%)	1797(19.4%)	9238 (100%)

II Ministry of Defence

Defence Research Laboratories. (Information not available)

III Ministry of Education

Anthropological Survey of India, 27, Jawaharlal Nehru Marg, Calcutta-13.	100(51.8%)	40(20.7%)	53(27.4%)	193 (100%)
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* S.T.= Scientists & Technologists; A.T.= Auxiliary Technical; and A.D.= Administrative.

Botanical Survey 83(8.3%) 547(54.7%) 369(36.9%) 999 (100%)
of India, 14, Madan
Street,
Calcutta-13.

National Atlas 50(37.8%) 75(56.8%) 7(5.4%) 132 (100%)
Organisation,
1, Acharya Jagdish
Bose Road,
Calcutta-20.

Archaeological (not available) (2929)
Survey of India,
New Delhi-11.

Zoological Survey 184(23.3%) 313(48.1%) 154(23.6%) 651 (100%)
of India,
34, Chittaranjan Avenue,
Calcutta-12.

Survey of India, (not available) (25525)
P.O. Box No.37,
Dehradun (U.P.).

Council of Scientific & Industrial Research.

Central Building 56(16.8%) 137(41.1%) 140(42.0%) 333 (100%)
Research Institute,
Roorkee.

Central Drug 101(30.5%) 157(47.4%) 73(22.1%) 331 (100%)
Research Institute,
Chattar Manzil Place,
Lucknow.

Central Electro- 62(26.5%) 135(57.7%) 37(15.8%) 234 (100%)
nics Engineering
Research Institute,
Pilani.

Central Electro- 121(23.8%) 295(58.1%) 92(18.1%) 508 (100%)
Chemical Research
Institute,
Karaikudi-3.

Central Food Technological Research Institute, P.O. V.V.Mohalla, <u>Mysore.</u>	96(17.7%)	318(58.8%)	127(23.5%)	541 (100%)
Central Fuel Research Institute, <u>Jealgaora,Dhanbad.</u>	105(13.3%)	551(69.7%)	134(17.0%)	790 (100%)
Central Glass & Ceramic Research Institute,Jadavpur, <u>Calcutta-32.</u>	55(16.8%)	183(55.9%)	89(27.2%)	327 (100%)
Central Indian Medicinal Plants Organisation, <u>Lucknow.</u>	21(28.0%)	26(34.6%)	28(37.3%)	75 (100%)
Central Leather Research Institute, Adayar, <u>Madras-20.</u>	62(21.7%)	159(55.7%)	64(22.5%)	285 (100%)
Central Mechanical Engineering Research Institute, <u>Durgapur-9.</u>	86(14.7%)	424(72.5%)	75(12.8%)	585 (100%)
Central Mining Research Station, Barwa Road, <u>Dhanbad.</u>	61(18.9%)	211(65.3%)	51(15.8%)	323 (100%)
Central Public Health Engineering Research Institute, Wardha Road, <u>Nagpur-3.</u>	97(21.1%)	215(46.8%)	147(32.0%)	459 (100%)
Central Road Research Institute, <u>New Delhi-20.</u>	93(34.0%)	107(39.2%)	73(26.7%)	273 (100%)
Central Salt and Marine Chemicals Research Institute, Waghadi Road, P.B.No. 38, <u>Bhavnagar.</u>	31(20.7%)	80(53.7%)	38(25.5%)	149 (100%)

Central Scientific Instruments Organisation, <u>Chandigarh.</u>	46(18.0%)	98(38.4%)	111(43.5%)	255 (100%)
Indian Institute of Experimental Medicine, 4 Raja S.C. Mullick Road, <u>Calcutta-32.</u>	29(39.7%)	34(46.5%)	10(13.7%)	73 (100%)
Indian Institute of Petroleum, <u>Dehra Dun.</u>	64(18.7%)	219(64.0%)	59(17.2%)	342 (100%)
National Aeronautical Laboratory, <u>Bangalore.</u>	65(16.6%)	248(63.6%)	77(19.7%)	390 (100%)
National Botanic Gardens, <u>Lucknow.</u>	42(6.7%)	398(64.2%)	180(29.0%)	620 (100%)
National Chemical Laboratory, <u>Poona-3.</u>	275(47.8%)	204(35.5%)	96 (16.7%)	575 (100%)
National Geophysical Research Institute, <u>Hyderabad-9.</u>	73(42.2%)	62(35.8%)	38(21.9%)	173 (100%)
National Institute of Oceanography, 7-B, Hauz Khas, <u>New Delhi-16.</u>	46(51.1%)	19(21.1%)	25(27.7%)	90 (100%)
National Metallurgical Laboratory, Burma Mines, <u>Jamshedpur.</u>	189(27.7%)	373(54.6%)	121(17.7%)	683 (100%)
National Physical Laboratory, Hill Side Road, <u>New Delhi-12.</u>	212(30.5%)	356(51.2%)	127(18.3%)	695 (100%)
Regional Research Laboratory, <u>Jammu, Tawi.</u>	119(45.2%)	100(38.0%)	44(16.7%)	263 (100%)

Regional Research Laboratory, <u>Jorhat (Assam).</u>	62(43.3%)	54(37.7%)	27(18.9%)	143 (100%)
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Regional Research Laboratory, <u>Uppal Road, Hyderabad-9.</u>	188(35.7%)	269(51.1%)	69(13.1%)	526 (100%)
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Regional Research Laboratory, <u>Bhubaneswar</u>	31(70.4%)	6(13.6%)	7(15.9%)	44 (100%)
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Sub-Total	2905(24.1%)	6413(53.2%)	2742(22.7%)	12060* (100%)
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IV Ministry of Food, Agriculture, Community Development and Co-operation

National Sugar Institute, <u>P.Box No. 16, Kannur.</u>	51(32.5%)	26(16.6%)	80(50.9%)	157 (100%)
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Forest Research Institute, <u>Dehra Dun.</u>	264(30.1%)	372(42.4%)	240(27.4%)	876 (100%)
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Forest Research Centre, <u>Coinbatore-2.</u>	11(39.3%)	10(35.7%)	7(25.0%)	28((100%)
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Grain Storage Research and Training Centre, <u>Hapur (U.P.).</u>	3(17.6%)	8(47.1%)	6(35.3%)	17 (100%)
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Indian Council of Agricultural Research

Indian Agricultural Research Institute, <u>Pusa Institute, New Delhi-12.</u>	1291(73.1%)	54(3.0%)	421(23.8%)	1766 (100%)
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* Excluding the figures of total staff at Archaeological Survey of India (2929) and Survey of India (25525).

National Dairy Research Institute, <u>Karnal (Punjab).</u>	218(36.1%)	243(40.3%)	142(23.5%)	603 (100%)
Indian Veteri- nary Research Institute, <u>Izatnagar...</u>	150(12.9%)	402(34.7%)	605(52.3%)	1157 (100%)
Central Potato Research Institute, <u>Simla.</u>	82(50.6%)	23(14.2%)	57(35.1%)	162 (100%)
Central Rice Research Institute, <u>Cuttack (Orissa.)</u>	117(34.4%)	159(46.7%)	64(18.8%)	340 (100%)
Central Arid Zone Research Institute, <u>Jodhpur.</u>	48(20.8%)	137(59.6%)	45(19.6%)	230 (100%)
Tuber Crops Research Institute, <u>Trivandrum (Kerala).</u>	23(33.3%)	26(37.7%)	20(28.9%)	69 (100%)
Indian Grassland and Fodder Research Institute, <u>Jhansi (U.P.).</u>	18(27.7%)	11(16.9%)	36(55.4%)	65 (100%)
Central Sheep and Wool Research Inst. <u>Malpura (Raj.).</u>	49(42.6%)	23(20.0%)	43(37.4%)	115 (100%)
Indian Lac Research Institute, <u>Nankum, Ranchi.</u>	12(5.7%)	107(50.7%)	92(43.6%)	211 (100%)
Central Arecanut Research Station, Vittal Post, (S.K) <u>Mysore State.</u>	45(32.1%)	43(30.7%)	52(37.1%)	140 (100%)
Jute Technological Research Labs. 12, Regent Park, Tollygunge, <u>Calcutta-40.</u>	7(11.6%)	40(66.7%)	13(21.6%)	60 (100%)

Jute Agricultural Research Institute, <u>Nilgaunge, (W.B.).</u>	127(50.4%)	50(19.8%)	75(29.7%)	252 (100%)
Central Tobacco Research Institute, <u>Rajahmundry.</u>	84(25.0%)	109(32.4%)	143(42.6%)	336 (100%)
Central Coconut Research Station, <u>Kayangulam (Kerala).</u>	6(7.1%)	54(64.3%)	24(28.5%)	84 (100%)
Central Coconut Research Station, <u>Kasaragod.</u>	28(28.0%)	25(25.0%)	47(47.0%)	100 (100%)
Sugarcane Breeding Institute, <u>Coimbatore.</u>	48(46.1%)	34(32.7%)	22(21.1%)	104 (100%)
Indian Institute of Sugarcane Research, <u>Lucknow-2.</u>	13(7.2%)	117(65.3%)	49(27.4%)	179 (100%)
Central Inland Fisheries Research Institute, <u>Barackpore, (West Bengal).</u>	170(52.5%)	4(1.2%)	150(46.3%)	324 (100%)
Central Marine Fishery Research Institute, Mandapam Camp, Distt. <u>Ramanathpuram. (Madras.)</u>	154(47.5%)	120(37.0%)	50(15.4%)	324 (100%)
Central Institute of Fisheries Tech. <u>Ernakulam.</u>	116(37.5%)	160(51.8%)	33(10.7%)	309 (100%)
Technological Research Laboratory (Cotton), Matunga, <u>Bombay.</u>	42(29.4%)	61(42.7%)	40(27.9%)	143 (100%)

Soil Conservation 16(44.4%) 9(25.0%) 11(30.5%) 36 (100%)
Research, Demonstration and Training,
Dehradun (U.P.).

Soil Conservation 7(38.9%) 7(38.9%) 4(22.2%) 18 (100%)
Research, Demonstration and Training,
Kotah (Rajasthan).

Soil Conservation 7(24.1%) 16(55.2%) 6(20.6%) 29 (100%)
Research, Demonstration and Training,
Ootacamund (Madras).

Soil Conservation 5(22.7%) 11(50.0%) 6(27.2%) 22 (100%)
Research, Demonstration and Training,
Bellary (Mysore).

Soil Conservation 17(43.6%) 16(41.0%) 6(15.4%) 39 (100%)
Research, Demonstration and Training,
Vasad (Gujarat).

Soil Conservation 4(33.3%) 5(41.7%) 3(25.0%) 12 (100%)
Research, Demonstration and Training,
Chandigarh.

Soil Conservation 3(23.1%) 7(53.8%) 3(23.1%) 13 (100%)
Research, Demonstration and Training,
Arra (U.P.).

Soil Conservation 3(9.7%) 14(45.1%) 14(45.1%) 31 (100%)
Research, Demonstration Training,
Hyderabad. (A.P.).

Sub-Total 3239(38.8%) 2503(29.9%) 2609(31.2%) 8351 (100%)

V Ministry of Health, Family Planning
and Urban Development

Central Food 27(41.5%) 13(20.0%) 25(38.5%) 65 (100%)
Laboratory,
Calcutta-16.

Central Leprosy Teaching and Research Institute, <u>Chingleput, Madras.</u>	23(9.6%)	189(79.0%)	27(11.3%)	239 (100%)
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Central Drugs Laboratory, <u>Calcutta-16.</u>	38(46.3%)	29(35.3%)	15(18.3%)	82 (100%)
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All India Institute of Hygiene and Public Health, <u>Calcutta-12.</u>	(not available)			570
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Central Research Institute, <u>Kasauli.</u>	29(21.3%)	52(38.2%)	55(40.4%)	136 (100%)
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Central Indian Pharmacopoeia Laboratory, <u>Ghaziabad.</u>	1(7.7%)	8(61.5%)	4(30.7%)	13 (100%)
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National Institute of Communicable Diseases, 22-Alipore Road, <u>Delhi-6.</u>	57(28.4%)	9(4.5%)	135(67.1%)	201 (100%)
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Indian Council of Medical Research

Cholera Research Centre, Kyd Street, <u>Calcutta-16.</u>	9(33.3%)	13(48.1%)	5(18.5%)	27 (100%)
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Nutrition Research Laboratories, Tarnaka, <u>Hyderabad-7.</u>	38(56.7%)	24(35.8%)	5(7.4%)	67 (100%)
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Tuberculosis Chemotherapy Centre, Chetput, <u>Madras-31.</u>	15(38.5%)	18(46.1%)	6(15.4%)	39 (100%)
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Virus Research Centre, Wellesley Road, Poona-1.	19(9.6%)	128(64.6%)	51(25.8%)	198 (100%)
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Indian Registry of Pathology, Safdarjung Hospital, New Delhi-16.	4(50%)	2(25%)	2(25%)	8 (100%)
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Sub-total	260(24.2%)	485(45.1%)	330(30.7%)	1075* (100%)
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VI Ministry of Irrigation and Power

Power Research Institute, Bangalore.	31(38.3%)	31(38.3%)	19(23.4%)	81 (100%)
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Central Water Power Research Station, Poona-24.	146(23.6%)	248(40.0%)	225(36.3%)	619 (100%)
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Central Soil Mechanics Research Station, Exhibition Grounds, New Delhi-1.	29(34.9%)	41(49.4%)	13(15.6%)	83 (100%)
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Sub-total	206(26.3%)	320(40.8%)	257(32.8%)	783 (100%)
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VII Ministry of Railways.

Research, Designs and Standards Organisation, Lucknow.	173(10.2%)	1099(65.1%)	417(24.6%)	1689 (100%)
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VIII Ministry of Steel, Mines & Metals

Geological Survey of India, 27, Chowringhee Road, Calcutta-13.	1187(20.7%)	2892(50.4%)	1661(28.9%)	5740 (100%)
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Grand Total	13721(35.2%)	15402(39.6%)	9813(25.2%)	38936** (100%)
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* Excluding the figures of staff at the All India Institute of Hygiene and Public Health (570).

** This figure does not include the total staff of Survey of India (25525), Archaeological Survey of India (2929), All India Institute of Hygiene and Public Health, Thumba Equatorial Rocket Launching Station and defence research laboratories.

PART TWO

Scientific Research Institutions under the
Government of India - a descriptive account.

The author is thankful to Miss Shanta Kohli for her
valuable help in the collection and collation of material
included in this section.

I Department of Atomic Energy

The Department of Atomic Energy is responsible for the formulation and implementation of policies in all matters concerning atomic energy. In addition, it is administratively concerned with a number of institutions which receive grants-in-aid from the Government of India through this Department.

These functions are carried out under the Atomic Energy Commission which was first constituted as an advisory body in 1948. The commission was reconstituted in 1958, with full powers of the Government of India, both administrative and financial, within the limits of the budget allocations made by Parliament. The Commission consists of both full-time and part-time members; the total number of whom should not be less than three and not more than seven. The Secretary to the Government of India in the Department of Atomic Energy is the ex-officio Chairman of the Commission. The Chairman, in his capacity as Secretary to the Government of India in the Department of Atomic Energy, is responsible under the Prime Minister for arriving at decisions on technical questions and advising Government on matters of atomic policy. All recommendations of the Commission on Policy and allied matters are put up to the Prime Minister through the Chairman, who has the power to override the other members of the Commission except that in financial matters in which the member concerned has the right to ask for a reference to be made to the Prime Minister and the Finance Minister.

The research units* under the Atomic Energy Commission are described in the subsequent pages.

- | | | |
|----|--|--|
| 1. | <u>NAME OF THE</u>
<u>INSTITUTION</u> | <u>BHABHA ATOMIC RESEARCH CENTRE</u>
<u>TROMBAY</u> |
|----|--|--|

YEAR OF ESTABLISHMENT:

Full fledged atomic energy programme launched in August 1954. Trombay Establishment formally inaugurated in January 1957. In January 1967, the Establishment was renamed as the Bhabha Atomic Research Centre.

* Excluding Tata Institute of Fundamental Research, Bombay, for which the necessary information was not available.

NAME OF THE DIRECTOR:

Shri H.N. Sethna

AIMS AND FUNCTIONS:

Research in application of radioisotopes in agriculture, biology, medicine and industry and nuclear energy as a source of cheap electric power.

STAFF:

Scientists and technical	5318
Auxiliary Technical	1546
Administrative Staff.	1681
Total	8545

MAIN DIVISIONS

- I. PHYSICS GROUP
 - (1) Nuclear Physics Division
 - (2) Technical Physics Division
- II. ELECTRONICS GROUP
 - (1) Electronics Division
 - (2) Health Physics Division
- III. DIRECTORATE OF RADIATION PROTECTION
- IV. ENGINEERING GROUP
 - (1) Architecture & Civil Engineering Division.
 - (2) Chemical Engineering Division.
 - (3) Engineering Services Division.
 - (4) Fuel Reprocessing Division
 - (5) Waste Treatment Division
- V. METALLURGY GROUP
 - (1) Analytical Division.
 - (2) Atomic Fuels Division.
 - (3) Chemistry Division.
 - (4) Isotope Division.
 - (5) Metallurgy Division.
 - (6) Radiochemistry Division.
 - (7) Reactor Engineering Division.
 - (8) Reactor Operations Division.
 - (9) Spectroscopy Division.

VI. BIOLOGY GROUP

- (1) Biochemistry and Food Technology Division.
- (2) Biology Division.
- (3) National Botanical Gardens.

VII. MEDICAL DIVISION

VIII. ADMINISTRATIVE GROUP

- (1) Accounts Division.
- (2) Personnel Division.
- (3) Purchase & Stores Division
- (4) Library and Technical Information Section.

MAIN ACHIEVEMENTS:

1. 380 MWe Tarapur Atomic Power Station.
2. 200 MWe units of the Rajasthan Atomic Power Station.
3. 400 MWe Madras Atomic Power Station.
4. Maximum use of indigenous skills and materials.
5. Extraction of plutonium
6. Additional auxiliary facilities for processing the irradiated power reactor fuels and irradiated thorium has progressed satisfactorily.
7. An experimental station for developing fast breeder reactors being set up adjacent to the Madras Atomic Power station.
8. The Jaduguda Uranium Mill.
9. New mechanised plant to process minerals present in the beach sands of Kerala.
10. Rare Earth Plant.
11. Heavy Water Plant Project.
12. Uranium Metal Plant.
13. Fuel Fabrication Facility at Trombay.
14. Fuel Complex.
15. Progress concerning methods of treating high medium and low level radioactive wastes.
16. Specialised training programmes in the field of atomic energy.

17. On the basis of processes and techniques developed **indigenously at the Bhabha** Atomic Research Centre, a large electronics complex is now coming up at Hyderabad. This complex has undertaken commercial scale production of electronic components, nuclear electronics instruments, reactor control systems and computers aimed at satisfying a substantial fraction of the overall requirements of the country.
18. The Bhabha Atomic Research Centre has continued to develop a number of instruments and processes with a view to indigenise work in the field of atomic energy to the maximum extent possible. Developments **include**
(a) production of high purity materials,
(b) extraction of rare elements, (c) development of special alloys, (d) successful development of flow-sheets for exploitation of by-products in uranium ore such as copper, nickel and molybdenum minerals and (e) development of D.C. plasma gun capable of operating at a power level of 60 kv. and producing temperatures ranging between 5,000° and 30,000° C.
19. The Seismic Array Station, Gouribidnur is **in operation**. This array is presently being extended to a 20 element array and the necessary instruments for this purpose are being developed. Studies on atomospheric fall-out from nuclear weapon tests were continued and methods of increased precision have been developed for the detection and estimation of fall-out products. Among the many special - purpose instruments designed and constructed **are** a 1024 channel pulse height analyser and a transistorised automatic data logging system for the meteorological power at the Tarapur Atomic Power Station site.
20. The production of isotopes and labelled compounds was considerably expanded and isotopes were exported to a number of countries in Europe, Africa and Asia. The first high specific activity cobalt source to be fabricated at Trombay was installed in a cobalt cancer therapy unit.

21. The development of radiation preservation processes for perishables such as fruits, vegetables, fish and milk products.
22. Yield trials on promising rice and ground nut mutants have established the higher yield capabilities of these mutants.
23. New methods of treatment of cancer of the gullet, cheek and tongue.
24. Significant progress has been made in a project to evaluate the use of phosphorus-32 in the early diagnosis of cancer in the nose and throat.

RESEARCH FACILITIES AND EQUIPMENTS:

There are three nuclear reactors at the Bhabha Atomic Research Centre:

"Apsara" a one-megawatt pool-type reactor; CIRUS, a reactor of 40 M.W. capacity and potentially one of the world's largest isotope producers; and "Zerlina", a zero energy experimental reactor. Other facilities at Trombay include a 5.5 MeV Van de-Graaff accelerator, a Thorium Plant, a Uranium Metal Plant, a Heavy Water Reconcentration Plant, and laboratories for the separation of stable isotopes and for loops. A Fuel Element Fabrication Plant produces fuel elements for CIRUS and Zerlina. This plant is also used for research and development work in new fuels and materials. India is one of the 6 countries in the world to have an operational plutonium plant for reprocessing irradiated fuel elements to obtain plutonium, a valuable fissile material for future power reactors. The Radio-chemistry and Isotope Laboratories at Trombay are producing radioisotopes and labelled compounds.

PUBLICATIONS:

BARC publishes scientific/technical papers, reports, from time to time. Developments of interest to the general public or scientific institutions are reported in the Department's monthly publication "Nuclear India", which also reports developments in all constituent units of the Departments of Atomic Energy.

2. NAME OF THE INSTITUTION THUMBA EQUATORIAL ROCKET LAUNCHING STATION.
TRIVANDRUM

YEAR OF ESTABLISHMENT: November 1963.

NAME OF THE DIRECTOR: Shri H.G.S. Murthy

AIMS AND FUNCTIONS:

The objective of TERLS is to operate, maintain and develop a range to support approved scientific experiments in the upper atmosphere, with necessary launch instrumentation and other facilities. Thumba was accorded UN sponsorship in December 1965.

MAIN DIVISIONS:

The Thumba Equatorial Rocket Launching Station (TERLS) has been organized into five major sub-divisions under the general supervision and guidance of the Director, Thumba Equatorial Rocket Launching Station. These consist of:

(a) Administrative Services

This section is responsible for general establishment, finance and accounts, stores, library and documentation, transport services, welfare services, security services and horticultural services.

(b) Engineering Services

The aim of this Division is to provide the general engineering services support in the nature of civil engineering, mechanical engineering (workshop facilities), electrical engineering and airconditioning services.

(c) Flight Test Division

This Division is responsible for the assembly, check out and launching of rockets from the range. The major areas of operation consist of vehicle launching, payload intergration, telemetry and radar tracking, range safety and vehicle analysis, communications, test and evaluation, meteorological support, data processing using computer and range photography.

(d) Development Divisions

This Division engages in design, development and fabrication of various electronic, mechanical and pyrotechnic hardware required for the flights from the range.

(e) Ground Based Experiments

These are basically physics experiments like ionospheric sounding experiments, riometer experiments, magnetometer experiments etc., which are required as additional support experiments for the rocket borne experiments.

MAIN ACHIEVEMENTS:

The following types of rocket experiments have been carried out from Thumba:

1. Proton magnetometer experiments for measuring the earth's magnetic field over the equatorial region.
2. Langmuir probe experiments for the purpose of measuring the ion density in the upper atmosphere.
3. Sodium vapour and Tri Methyl Aluminium vapour experiments for the purpose of measuring the intensity and direction of wind in the higher altitudes.
4. Meteorological experiments using Chaff for studying stratospheric winds.

These experiments have been carried out by both Indian and foreign scientists and the results are published by the individual scientists. Interesting data has been obtained in the above experiments which has been attributed to the equatorial electro jet over Thumba.

BASIC FACILITIES EXISTING AT TERLS

- (a) Rocket assembly, check out and launching.
- (b) Payload assembly, check out and monitoring.
- (c) An FM-FM, IRIG telemetry trainer.
- (d) A Cotal LV-300 tracking radar operating in the S-band with a peak power of about 800 KW.
- (e) A Doppler velocity and position (DOVAP) system for providing rocket trajectories.
- (f) Radio communication facilities.
- (g) A well equipped electronic research & development laboratory.

- (h) Photographic facilities with a high speed movie camera for rocket photography.
- (i) A technical library.
- (j) Ground based experiments as specified earlier.

PLACE IN COUNTRY'S DEVELOPMENTS:

The station has enabled the country to keep in touch with developments in space technology and has helped Indian scientists to acquire experience in this field.

3. NAME OF THE INSTITUTION PHYSICAL RESEARCH LABORATORY
AHMEDABAD-9

YEAR OF ESTABLISHMENT: 1948

NAME OF THE DIRECTOR: Dr. Vikram A. Sarabhai

AIMS AND FUNCTIONS:

The Physical Research Laboratory is dedicated to an intensive and correlated study of the various electromagnetic and corpuscular radiations incident on the earth and of their geophysical consequences. The Laboratory also serves as a centre for post-graduate study of some aspects of experimental and theoretical physics in Western India.

On the research side, it has been devoting attention to Cosmic Rays, Atomospheric Physics (including Atomospheric Ozone, Airglow, Ionospheric Physics and Solar Terrestrial Relationships) and theoretical studies on nuclear structure. Recently, the Laboratory has undertaken studies in Space Physics, including construction of pay loads for rockets fired from Thumba (near Trivandrum) to study the properties of the upper atomosphere over the magnetic equator up to 200 km. A Satellite Telemetry Station has been installed at Ahmedabad, which has undertaken studies of the electron content of the upper ionosphere and ultra violet and X-rays from the Sun. Cosmic Ray work with equipment carried in large balloons has been planned. A department of Theoretical Astrophysics has recently been added, which offers scope for researches in magneto-hydrodynamics and inter-stellar and inter-planetary space.

The objectives of the Laboratory are:

<u>Primary</u>	<u>Supportive</u>	<u>Secondary</u>
Advanced Research in 1.1 Aeronomy 1.2 Cosmic Rays & Astronomy.	1.3 Theoretical Physics (Nuclear, Elementary Particles, Hydromagnetics). 1.4 Experimental Techniques.	1.5 Advanced Training

For the advancement of the scientific objectives of the Laboratory, 4 scientific areas are being created.

They are:

1. Aeronomy
2. Cosmic Rays and Astronomy
3. Theoretical Physics
4. Experimental Techniques (Electronics, Instrumentation and Computation).

The functions of area committees would be to periodically discuss latest advances in science in their respective fields and work done elsewhere and at the Laboratory. Area Committees would also concern themselves with the development of the quality and the quantity of research output in each area and make recommendations to the Director.

STAFF:

As on 1st September 1967.

Scientific Staff.	= 71 (including 28 Research Scholars)
Technical Staff:	121
Administrative Staff.	40
Auxiliary Staff.	30
Total	<u>262</u>

MAIN DIVISIONS:

1. Techniques Laboratory.
2. Electronics Laboratory.

3. Computing Centre.
4. Cosmic Rays.
5. Solar-Terrestrial Relationships and Astrophysics.
6. Aeronomy and Geomagnetism.
7. Theoretical Physics.
8. Defence Project and
9. Balloon Project.

MAIN ACHIEVEMENTS:

- (i) Techniques Laboratory (a) A vacuum system for vacuum deposition of thin films is nearing completion. An environmental chamber giving -30° to + 50°C and a vacuum of 10⁻⁵ Torr are being designed and will be constructed with the help of BARC.
(b) A set up for polishing solid surfaces is being constructed in the workshop.
(c) The necessary equipment for printed circuit board has been acquired and is in use.
(d) An ultra - high vacuum system for removing impurities from gases is under design.
- (ii) Electronics Laboratory - (a) 12 regulated Low Voltage Power Supplies varying between 0 to 30 V and having a current capacity of 2 Amp. were under construction.
(b) Regulated medium voltage power supplies 250 - 300 V, 150 mA.
(c) A prototype of FM transmitter working at 108 Mc/s.
- (iii) Computing Centre: - (a) Consultation in computer applications like scientific programming, business applications, programme writing and debugging.
(b) Training in Programming in various computer languages for IBM 1620 data processing system.
- (iv) Recording of Cosmic Rays at ground level.

- (v) Cosmic Ray and X-Ray studies with Balloon Borne Detectors.
- (vi) Cosmic Rays in Interplanetary space.
- (vii) Cosmic Ray Air Showers.
- (viii) Development of Electronic Instrumentation for Cosmic Rays: -
 - (a) Crystal Controlled electronic clock
 - (b) Single channel pulse height analyser
 - (c) Frequency and period counter
 - (d) Counting rate meter and
 - (e) Sub-carrier discriminators
- (ix) Studies of the lower ionosphere by rocket borne longmuir and temperature probes.
- (x) Measurements of drift and absorption on 2.6 Mc/s.
- (xi) Recording of signal strength and polarisation of 164 Kc/S. Tashkent transmissions.
- (xii) Construction of high power pulsed transmitter for drift and absorption work.
- (xiii) Analysis of the ionospheric wind information from the six launchings with sodium vapour payloads.
- (xiv) Stellar photograph measurements for determining the lens distortion correction.
- (xv) A magnetometer payload.
- (xvi) Effective nuclear interactions and the structure of nickel isotopes have been studied.
- (xvii) The structure of low-lying states of cadmium nuclei has been studied. The validity of a well - known prescription regarding the lowest energy wave - functions with different angular momenta was tested by comparing the shell model and projected wave functions for a number of nuclei ranging from O^{18} to Mo^{94} .
- (xviii) Satisfactory explanation for the occurrence of rotational spectra in the s-d shell and its absence in the f-p shell.

- (xix) Useful studies in the interactions of pions with the p-shell nuclei

PUBLICATIONS:

1. No. of Papers concerning cosmic rays astrophysics, radio and x-ray astronomy and solar terrestrial relationships = 16
2. No. of papers concerning aeronomy and geomagnetism. = 25
3. No. of papers concerning theoretical physics. = 7

PLACE IN COUNTRY'S DEVELOPMENT:

It is a Scientific Research Institution associated with the Department of Atomic Energy, Government of India. It has been entrusted with the administrative control of the Experimental Satellite Communication Earth Station at Ahmedabad.

4. NAME OF THE INSTITUTION EXPERIMENTAL SATELLITE COMMUNICATIONS EARTH STATION, AHMEDABAD.

YEAR OF ESTABLISHMENT: 1964

NAME OF THE DIRECTOR: Wing Commander K.R. Rao

AIMS AND FUNCTIONS:

A centre for experimentation, research and training in satellite communications technology.

STAFF:

Technologists (electronic engineers and electronic technicians)			13
Auxiliary Technical staff	Civil	4	
	Mechanical	10	
	Electrical	6	24
	Others	4	
Administrative staff.			37
	Total		74

This is the first satellite communication ground station in India. Some of the technology in use here is less than 10 years old in the world in the field of electronics. Hence, this station can effectively contribute to the development of know-how in certain fields of electronics. Further, it is planned to utilize the Station to demonstrate the effectiveness of satellite communications not only as a solution to long distance communications but also as a powerful medium of mass communication. The training facilities available in the Station can train 48 people per year in the new technology.

5. NAME OF THE SAHA INSTITUTE OF NUCLEAR PHYSICS,
INSTITUTION: CALCUTTA

YEAR OF ESTABLISHMENT: 1951

NAME OF THE DIRECTOR: Dr. D.N. Kundu (Acting)

AIMS AND FUNCTIONS:

- (a) Providing facilities for and offering courses of instruction in both Elementary and Advanced Nuclear Physics and Biophysics to students appearing for the M.Sc. degree in Physics of the Calcutta University.
- (b) Offering facilities leading to the Associateship of the Institute to Post M.Sc. Students for training to carry out research in Nuclear Physics and Biophysics.
- (c) Conducting research work in Nuclear Science in its various aspects.

STAFF:

Scientific and Technical.	228
Administrative Staff.	39
Auxiliary Technical Staff.	90
Total	357

MAIN DIVISIONS:

- (1) Cyclic Accelerators
- (2) Electrostatic Generators
- (3) Mass Spectroscopy
- (4) Nuclear Chemistry
- (5) Solid State & Molecular Physics
- (6) High Resolution NMR Studies
- (7) X-ray Crystallography and Molecular Biology

- (8) Theoretical Nuclear Physics
- (9) Instrumentation
- (10) Plasma Physics
- (11) Radiation Biology
- (12) Electron Microscopy
- (13) Physical Biology
- (14) Molecular Genetics
- (15) Technical Physics
- (16) Post M.Sc. Teaching

MAIN ACHIEVEMENTS:

The Institute grew with the 37" cyclotron and the electron microscope which was developed in the laboratory. With both these instruments, important scientific research has been done in the fields of Nuclear Physics and Biophysics. The laboratory developed the instrumentation for Nuclear Magnetic Resonance studies and made outstanding contributions in both theoretical and experimental aspects of this branch. With the development of new type of mass spectrometers, important investigations have been done in the field of sputtering and ion exchange by gases. The Institute has also made outstanding contributions in the field of theoretical Nuclear Physics and Solid State Physics. In the last ten years the Institute has made important additions of instruments like powerful Electron Microscope, Isotope Separator, Wide Band Nuclear Resonance Spectrometer, and has also developed many other instruments in Nuclear Physics, Solid State Physics, Plasma Physics, Biophysics and other associated branches in all of which vigorous investigations are being done. The Institute has made outstanding contributions in the training of research students in the field of Nuclear Physics and Solid State Physics through its Post M.Sc. Associateship Course.

PLACE IN COUNTRY'S DEVELOPMENT:

Notwithstanding the fact that the Institute is mainly engaged in research in the fields of Physics and Biophysics, it has made important contributions in the training of teachers and scientists. The Institute has, since its inception, collaborated with the Calcutta University in the training of students in Nuclear Physics and Biophysics. Through its advanced Post M.Sc. teaching programme established in 1952, it has contributed teachers and advanced research workers in the field of nuclear physics and other branches of physics to many universities and institutions. Through the Institute's advanced research programme many physicists were trained and are serving in various parts of the country.

II MINISTRY OF DEFENCE

Research and development of defence equipment has gained a lot of importance during recent years. The Ministry of Defence has established 27 research laboratories to undertake research work in various areas of defence sciences. These laboratories function under the Defence Research and Development Organisation in the Ministry of Defence.

The Defence Research and Development Organisation was set up in 1958, when the research and development activities, which were hitherto the responsibility of the Defence Production Organisation, were organised under a separate agency. The principal functions of the Organisation are:-

- (a) to undertake research, development and design relating to equipment for the three Services, including armaments, ammunition, electronics, aircraft, vehicles and engineering stores;
- (b) to co-ordinate all matters affecting defence research and development; and
- (c) standardisation of defence equipment and stores.

The Defence Research and Development Organisation is headed by the Scientific Adviser to the Defence Minister (who is also the Director General of Research and Development). He is assisted by a Chief Controller (Research and Development), Director of Technical Development and Production (Air), Directorate of Administration and a Chief Scientist. The Chief Controller is responsible for co-ordinating research and development programmes with the Services.

The Chief Scientist is responsible for co-ordination of research in the research and experimental establishments, liaison with the Universities, National laboratories and research institutions, and also for contacts with Commonwealth countries in matters of defence research interest.

The research laboratories under the Defence Research and Development Organisation are described in the following pages.

1. NAME OF THE INSTITUTION ARMAMENTS RESEARCH AND DEVELOPMENT ESTABLISHMENT, KIRKEE-POONA

NAME OF THE DIRECTOR: Brig. Pritampal Singh

AIMS AND FUNCTIONS :

The Armaments Research and Development Establishment is concerned with research, design and development work in respect of all types of weapons, ammunition and allied stores for the three Services. The work extends to investigations and experiments for determining causes of failure. Modifications relating to design and functional improvements of armaments are undertaken, and technical proving trials on new armaments are carried out to assess their performance. In addition, technical guidance to civil trade is rendered for producing prototypes of armament stores.

The activities also include firing and war trials to assess the performance of indigenously produced war-like stores.

2. NAME OF THE INSTITUTION DEFENCE METALLURGICAL RESEARCH LABORATORY, HYDERABAD-23

NAME OF THE DIRECTOR: Dr. R.V. Tamhankar

AIMS AND FUNCTIONS:

This Laboratory is responsible for research and development on metals and alloys for use in defence equipment, both warlike and non-warlike.

Defence applications of metallurgy are very much specialised. Metallurgical applications in electronics, communication, weapons, ammunition, vehicles, instruments, aircraft, high temperature metallurgy, etc., all combine to make defence metallurgy a subject of great significance.

The work covers development of new alloys and techniques and knowhow for alloys of known proprietary composition. Studies in fundamental and applied aspects of metallurgical science are also undertaken.

The Laboratory is responsible for laying down standards of acceptability of all defence metallurgical stores.

3. NAME OF THE INSTITUTION EXPLOSIVES RESEARCH AND DEVELOPMENT LABORATORY, KIRKEE-POONA

NAME OF THE DIRECTOR: Dr. W.D. Patwardhan

AIMS AND FUNCTIONS:

The scope of work of this Laboratory covers research, development and inspection of all kinds of explosives, including screening and coloured smokes, pyro-technics, incendiary explosives, high explosives, initiators, ignitors and caps compositions. Research and development work on chemicals, paints, varnishes and other non-explosive materials which have a direct bearing on ammunition production is also undertaken in this laboratory. This Laboratory is also responsible for improving test methods to evaluate the performance of explosives.

4. NAME OF THE INSTITUTION INSTRUMENTS RESEARCH & DEVELOPMENT ESTABLISHMENT, DEHRA DUN

NAME OF THE DIRECTOR: Dr. B.N. Singh

AIMS AND FUNCTIONS:

This Establishment is devoted to research, design and development of all optical, fire control, survey, drawing and photographic instruments, watches and clocks, certain categories of medical instruments, map reproduction, X-ray film and various ancillary stores used by the Services.

Advice is rendered to industrial firms to develop indigenous capacity for the manufacture of scientific instruments needed by the Armed Forces.

Investigations on tropic-proofing and tropicalisation methods and on materials for instruments form another important activity of this Establishment.

5. NAME OF THE INSTITUTION PROOF & EXPERIMENTAL ESTABLISHMENT, BALASORE (Orissa)

NAME OF THE DIRECTOR: Supdt. Col. Parkash Singh

AIMS AND FUNCTIONS:

This Establishment is equipped to undertake proving trials in respect of every type of Army or Naval guns and ammunition.

Among the many important functions performed by this Establishment, mention may be made of proof of ammunition and guns, derivation of ballistic data for range tables, naval proof and periodical check-proof of ammunition stocks. The work involves a great deal of precision measurement and collection of data to enable accurate prediction of weapon performance.

6. NAME OF THE INSTITUTION DEFENCE RESEARCH AND DEVELOPMENT LABORATORY, HYDERABAD(Dn.)-5

NAME OF THE DIRECTOR: Air Cdre V. Ganesan

AIMS AND FUNCTIONS:

The primary objective of this Laboratory is to undertake research, design and development leading to indigenous production of rockets and special weapons.

7. NAME OF THE INSTITUTION TERMINAL BALLISTIC RESEARCH LABORATORY, CHANDIGARH

NAME OF THE DIRECTOR: Dr. Sampooran Singh

AIMS AND FUNCTIONS:

This Laboratory deals with basic problems connected with detonation of explosives and terminal ballistics, terminal studies of hyper-velocity impact, transient phenomena, behaviour of metals under impulsive loads, forming of metals by high explosives and shock induced cavitation.

The work of the Laboratory also includes basic research on build-up of detonation in fuses, its transfer from the fuse to the main high explosive filling of a shell, blast characteristics of a shock wave arising by detonation of explosives and evaluation of explosive stores and study of high speed phenomena.

8. NAME OF THE INSTITUTION ELECTRONICS AND RADAR DEVELOPMENT ESTABLISHMENT, BANGALORE

NAME OF THE DIRECTOR: Brig. S.K. Malhotra

AIMS AND FUNCTIONS:

The chief functions of this equipment-oriented Establishment are: to design and develop electronic equipments to cater to the needs of Armed Forces, to advise the Services in making the maximum use of existing electronic equipment by modification and/or redesigning when necessary; to assist in the establishment of indigenous production of electronic equipment for Service use; and to investigate futuristic circuit designs and techniques for equipment, materials and processes for the development of components and accessories.

9. NAME OF THE INSTITUTION SOLID STATE PHYSICS LABORATORY DELHI-7

NAME OF THE DIRECTOR: Dr. N.B. Bhatt

AIMS AND FUNCTIONS:

This Laboratory conducts basic studies on solid state phenomena, investigations on materials and techniques and development work on solid state devices.

10. NAME OF THE INSTITUTION DEFENCE ELECTRONICS RESEARCH LABORATORY, HYDERABAD-5

NAME OF THE DIRECTOR: Shri V.N. Rao

AIMS AND FUNCTIONS:

The main objective of the Laboratory is to promote research in the field of electronics with a view to applying the results for the design and development of futuristic range of defence equipment.

The major fields of investigation are microwaves, radar propagation, communication, computer and servomechanisms, special devices and materials. Investigations on problems like wave propagation at various locations/field stations are also conducted by the Laboratory.

11. NAME OF THE INSTITUTION HIMALAYAN RADIO PROPAGATION UNIT, LANDOUR (MUSSOORIE)

NAME OF THE DIRECTOR: Dr. E. Bhagiratha Rao

AIMS AND FUNCTIONS:

This Establishment is responsible for carrying out radio propagation studies peculiar to the Himalayan regions, to assist the Services in making the best use of the existing communication equipment in mountainous terrain and to advise the Services and the sister Laboratories in the electronics group on propagation conditions affecting the selection and design of futuristic communication equipment.

12. NAME OF THE INSTITUTION RESEARCH & DEVELOPMENT ESTABLISHMENT (ENGINEERS), DIGHI-POONA

NAME OF THE DIRECTOR: Brig. A.C. Aga

AIMS AND FUNCTIONS:

The Establishment is concerned with a large number of engineering research and development problems which are of special concern to Armed Forces. These include: workshop machinery, bridging, rafting and water craft, road and air lifting devices, bomb disposal equipment and demolition stores, road making machinery (other than earth-moving tractors), water supply and POL equipment and industrial engines exclusively used for engineering equipment.

The Establishment also carries out inspection of engineering equipment.

13. NAME OF THE INSTITUTION VEHICLES RESEARCH & DEVELOPMENT ESTABLISHMENT, AHMEDNAGAR.

NAME OF THE DIRECTOR: Shri D.P. Mukherjee

AIMS AND FUNCTIONS:

This Establishment is responsible for research and development work including design, defect investigations on armoured fighting, wheeled vehicles, tractors and trailers required by the Services.

14. NAME OF THE INSTITUTION AERONAUTICAL DEVELOPMENT ESTABLISHMENT,
BANGALORE

NAME OF THE DIRECTOR: Dr. O.P. Mediratta

AIMS AND FUNCTIONS:

This Establishment is responsible for assisting in evolving aeronautical standards and specifications, to evolve test procedures for evaluating new and prototype aircraft equipment and aircraft materials, to undertake research and development for improvement of safety, performance and reliability of aircraft and their equipment and to design and develop special items of aeronautical equipments.

15. NAME OF THE INSTITUTION GAS TURBINE RESEARCH ESTABLISHMENT,
BANGALORE

NAME OF THE DIRECTOR: Gp. Capt. S.N. Roy Chaudhury

AIMS AND FUNCTIONS:

This Establishment is concerned with the design and development of aircraft propulsion systems. Facilities are being set up for compressor testing, combustion chamber testing and for design and development of gas turbine engines.

16. NAME OF THE INSTITUTION DEFENCE RESEARCH LABORATORY
(MATERIALS), KANPUR

NAME OF THE DIRECTOR: Dr. J.N. Nanda

AIMS AND FUNCTIONS:

This Laboratory is primarily devoted to research and development on all non-warlike stores, like fuels, oils, lubricants, surface coatings, drugs & pharmaceuticals, organic & inorganic chemicals, natural & synthetic fibres, and other general stores.

The research activity of the Laboratory is broadly related to basic materials (except metals), biological and non-biological degradation of defence stores, including metallic corrosion, equipment preservation and packaging of stores and packaging materials.

The Laboratory also undertakes specification testing of tender and supply samples of chemicals, oils, paints, petroleum products, drugs and pharmaceuticals, laboratory appliances and allied stores as a part of its normal functions.

17. NAME OF THE INSTITUTION DEFENCE SCIENCE LABORATORY,
DELHI-6

NAME OF THE DIRECTOR: Dr. Kartar Singh

AIMS AND FUNCTIONS:

The Defence Science Laboratory is essentially devoted to basic and applied research in physics, chemistry, mathematics, operational research, statistics and related sciences.

The Laboratory also provides a full range of scientific documentation and information service for Defence Establishments/Laboratories and also to agencies outside the Defence sector.

In addition to its research activities, an important assignment of this Laboratory is the training of defence research apprentices for eventual absorption in the Defence Science Service. It also runs training courses for candidates preparing for the A.M.I.E. Examination, Parts A & B, which is a part of the general programme of Government to augment technical manpower in the country.

18. NAME OF THE INSTITUTION DEFENCE LABORATORY, JODHPUR

NAME OF THE DIRECTOR: Dr. B.K. Banerjee

AIMS AND FUNCTIONS:

The scope of work of this Laboratory is two-fold: research on arid zone problems as related to Defence and field testing of weapons and equipment.

As a research laboratory, it is mainly devoted to basic research of significance to military operations in arid zones, desert climatology, utilisation of solar energy for defence needs, and water treatment and its conservation.

As a field station, the Laboratory undertakes field trials on weapons and equipment in hot dry climates, trafficability studies in loose soil, collection and collation of meteorological and environmental data, and research on environmental physiology, radio-wave propagation and other studies which are the responsibility mainly of other R & D establishments/laboratories.

Development and production of prototypes of training aids and films for the three Services to facilitate training of Service personnel also form part of the functions of this Laboratory

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| 19. | <u>NAME OF THE INSTITUTION</u> | <u>DEFENCE FOOD RESEARCH LABORATORY,</u>
<u>MYSORE</u> |
|-----|--------------------------------|---|

NAME OF THE DIRECTOR: Dr. P.K. Vijayaraghavan

AIMS AND FUNCTIONS:

This Laboratory is concerned with research and development work on food problems peculiar to conditions met in areas where troops are deployed; improvements in peace time rations and development of special rations, like emergency rations, hard scale rations, survival rations, etc. and development and production of processed foodstuffs for inclusion in various rations. Investigations in the cognate fields of human nutrition, microbiology of foods, preservation and packaging of foodstuffs, and food technology are also undertaken in this laboratory.

20. NAME OF THE INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES, CHHATRA MARG, DELHI-7.

NAME OF THE DIRECTOR: Col. S.K. Mazumdar

AIMS AND FUNCTIONS:

The Institute is devoted to the study of radio isotopic and radiation techniques in fields of interest

to Defence with special reference to the use of radio isotopes and ionising radiations for diagnostic and therapeutic purposes.

The Institute is also concerned with research and development of nuclear instruments, remote handling equipment and other equipment necessary for radiation hygiene and health physics. Training of physicians and allied scientists who require to be orientated to the use of ionising radiations and radio isotopes in the biomedical field is also undertaken at the Institute in collaboration with the Delhi University.

21. NAME OF THE INSTITUTION DEFENCE INSTITUTE OF PHYSIOLOGY AND ALLIED SCIENCES, MADRAS

NAME OF THE DIRECTOR: Surg. Capt. M.S. Malhotra

AIMS AND FUNCTIONS:

This Institute conducts basic and applied research in physiology and bio-chemistry as related to Defence needs and directs and co-ordinates physiological research carried out by field research stations and other defence research laboratories.

22. NAME OF THE INSTITUTION INDIAN NAVAL PHYSICAL LABORATORY, COCHIN

NAME OF THE DIRECTOR: Dr. D. Srinivasan

AIMS AND FUNCTIONS:

The Laboratory undertakes research and development work in the fields of oceanography, acoustics, magnetism, electronics and mines and counter measures as related to the requirements of the Indian Navy. It also renders scientific assistance to the Navy in the maintenance and development of equipment through modification and indigenous production.

23. NAME OF THE INSTITUTION NAVAL CHEMICAL & METALLURGICAL LABORATORY, BOMBAY

NAME OF THE DIRECTOR: Dr. J.P. De

The main objective of the Laboratory is to provide scientific assistance in maintaining the equipment and ships of the Navy in an efficient and sea-worthy condition.

Towards the fulfilment of its objective, the Laboratory undertakes research and development work on marine corrosion, marine borers and fouling organisms, and evolution of protective measures against corrosion and attack by borers and fouling organisms. Service failure of ships and naval stores are also investigated as and when called upon.

Examination of tender and experimental samples, consisting of underwater paints, metals, alloys, petroleum products and general chemicals is a part of the normal activities of the Laboratory.

24. NAME OF THE FIRE SERVICE* RESEARCH, DEVELOPMENT &
INSTITUTION TRAINING ESTABLISHMENT, DELHI CANTT.
NEW DELHI-10

NAME OF THE DIRECTOR: Commandant: Shri P.N. Ghosh

AIMS AND FUNCTIONS:

This Establishment is a training-cum-research centre. The scope of work covers training of defence personnel in fire prevention and fire fighting methods, rendering advice to the Services on fire prevention and fire fighting, developing fire service equipment and appliances from indigenous materials and evaluation of new equipment.

25. NAME OF THE DIRECTORATE OF PSYCHOLOGICAL RESEARCH
INSTITUTION NEW DELHI-11.

NAME OF THE DIRECTOR: Col. Kirpal Singh

AIMS AND FUNCTIONS:

This Directorate is concerned with military psychology, human engineering and human operator research.

The Directorate conducts research in personnel selection methods, evaluation of training methods and development of training aids. Advice is rendered to the Services on human engineering and human operator

problems and on problems relating to officer selection and personnel classification and follow up. The Directorate also trains personnel in selection procedures both for officers and other ranks and renders guidance in personnel selection.

26. NAME OF THE INSTITUTE OF ARMAMENT TECHNOLOGY,
INSTITUTION POONA

NAME OF THE DIRECTOR: Cdre. M.K. Lele

AIMS AND FUNCTIONS:

The main function of this Institute is to train officers of the Defence Service and Defence civilian scientists in various fields of science and technology of armaments. It conducts courses on basic science and technology and in advanced fields of specialisation as approved by Government from time to time. The Institute also undertakes basic and applied research with a view to promoting technological developments of specific interest to Defence.

27. NAME OF THE INSTITUTE OF WORK STUDY, LANDOUR,
INSTITUTION MUSSOORIE

NAME OF THE DIRECTOR: Col. V. Dhruva

AIMS AND FUNCTIONS:

The Institute conducts courses of training for personnel at all levels of the Defence Services and Interservices organisations under the Ministry of Defence in work study methods and allied subjects. It also provides assistance to establishments and organisations of the Services when requested to do so in the actual execution of practical projects in work study and generally coordinates work study activities in Defence organisations.

III MINISTRY OF EDUCATION

There are at present, 6 scientific research institutions directly under the Ministry of Education. In addition, the Council of Scientific and Industrial Research, which is under the administrative control of the Ministry of Education, has 28 research laboratories (called National Laboratories) under it. A brief description of all these research institutions is given in the following pages.

SCIENTIFIC RESEARCH INSTITUTIONS DIRECTLY ADMINISTERED BY THE MINISTRY

1. NAME OF THE INSTITUTION ANTHROPOLOGICAL SURVEY OF INDIA
27, JAWAHARLAL NEHRU MARG, CALCUTTA-13

YEAR OF ESTABLISHMENT: 1945

NAME OF THE DIRECTOR: Dr. D.K. Sen

AIMS AND FUNCTIONS:

This organisation conducts studies of ethnic communities of different categories in respect of their physical, social, cultural, linguistic and psychological aspects.

STAFF:

Scientific staff:	100
Auxiliary Technical staff:	40
Administrative staff:	53
Total	<u>193</u>

MAIN DIVISIONS:

1. Physical.
2. Cultural Anthropology.

Besides, there are other Scientific Sections, namely, Psychology, Radiology, Biochemistry, Linguistics and Human Ecology and the Auxiliary division comprising Statistics, Library, Printing and Publication, and Artist and Photography Sections.

The Survey has four regional stations located at Nagpur, Mysore, Shillong and Port Blair.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

There are adequate library and laboratory facilities. The Library with a total number of about 27,000 books and periodicals is perhaps the largest Anthropological Library in Asia. There are innumerable skulls both Prehistoric and Modern, in the Osteological Laboratory. There are Laboratories for basic research in Human-Biology, Growth study, Psychology and Bio-Chemistry. The Survey has also an archive for basic data and sends out parties every year for field investigation.

PUBLICATIONS:

1. Bulletin - Four issues in a year.
2. Memoir - Two issues in a year.
3. Casual publication - as and when some study is completed.

*** The publications are published in English but they are translated in Hindi, Bengali, Tamil and Urdu.

PLACE IN COUNTRY'S DEVELOPMENT:

Encourages basic research of ethnic communities of different categories in the field in respect of their physical, social, cultural, linguistic and Psychological aspects.

<u>NAME OF THE INSTITUTION</u>	<u>BOTANICAL SURVEY OF INDIA</u> <u>14, Madan Street, Calcutta-13</u>
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<u>YEAR OF ESTABLISHMENT</u>	1890
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2. <u>NAME OF THE DIRECTOR:</u>	Dr. H. Santapau
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AIMS AND FUNCTIONS:

1. To explore the plant resources of the country by systematic survey so as to obtain fullest possible knowledge of the flora of India, which can be utilised in enriching the vegetable wealth of India.
2. To act as the keepers of the botanical collection of India on which the identifications of the flora of India is based.
3. To carry on all scientific work for the fulfilment of its objectives.

STAFF:

Scientists and technologists.	83
Auxiliary Technical staff.	547
Administrative staff.	369
Total	<u>999</u>

MAIN DIVISIONS:

1. Headquarters Organisation, Calcutta.
2. Central Botanical Laboratory, Calcutta.
3. Central National Herbarium, Howrah.
4. Indian Botanic Garden, Shibpore, Howrah.
5. Industrial Section, Indian Museum, Calcutta.
6. Eastern Circle, Shillong, Assam.
7. Central Circle, Allahabad, U.P.
8. Northern Circle, Dehra Dun, U.P.
9. Southern Circle, Coimbatore, Madras.
10. Western Circle, Poona, Maharashtra.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Survey has developed into a premier research organisation for the study of taxonomy and systematic botany of angiosperms, floristics and plant geography of different regions of the country. In the Experimental Gardens under its aegis, facilities exist for comparative studies of the wild species, their growth, habits, the variations in their morphological character in relation to their surroundings and such other problems connected with the correct identity and status of the species and other related taxonomical and ecological problems.

There are a number of research scholarships instituted by the Botanical Survey of India and the research work conducted by the scholars under the guidance of the officers of the Survey forms a thesis for Ph.D. Degree, if the Institution and the guide under whom such scholars work are recognised by the University concerned.

The Central National Herbarium and the Libraries are parts of the Survey organisation.

In short, it may be stated that library, laboratory and Herbarium facilities are available in the Survey for doing research work.

PUBLICATIONS:

- (a) Scientific periodicals:
 - (i) Bulletin of the Botanical Survey of India (quarterly)
 - (ii) Records of the Botanical Survey of India (annual)
 - (iii) Annals of the Indian Botanic Garden (annual)
- (b) Other regular publications, Reports of the Botanical Survey of India.
- (c) Miscellaneous: Floras of Bombay, Madras, Bengal and Bihar, Gangetic Plains, Bengal Plants.
- (d) Popular books - e.g. Himalayan flowering plants.
(All published in English Language)

PLACE IN COUNTRY'S DEVELOPMENT:

Pioneer premier botanical research institute in India, with a National Herbarium.

The results of such surveys and research is of considerable importance in connection with the development of agriculture, forestry, plant systematics and botany, soil sciences, pharmaceuticals, and general commercial utilisation of various species of plants.

3. NAME OF THE INSTITUTION NATIONAL ATLAS ORGANISATION,
1-ACHARYA JAGDISH BOSE ROAD CALCUTTA-20.

YEAR OF ESTABLISHMENT: 1956

NAME OF THE DIRECTOR: Prof. S.P. Chatterjee,
M.Sc., Ph.D., D. litt.

AIMS AND FUNCTIONS:

1. Bringing out National Atlases of India, in Hindi and English and then in other regional languages of the country. The maps contained in the Atlases envisages to depict the complex physical and natural conditions and the socio-economic characters of different regions as well as that of the country as a whole.

2. To collect data and information on various subjects, from different sources e.g. Government departments, Private agencies, other publications etc., compile them and to process them to a mappable form and prepare maps on the basis of that.

STAFF:

Research and Technical	50
Auxiliary Technical	75
Administrative	7
Total	<u>132</u>

MAIN DIVISIONS:

1. Research and Technical: This division has four smaller sections to carryout the specialised works.
2. The Camera Unit.
3. Book and Map Library.
4. Statistical Section and the Technical Correspondence Section.
5. Aerial Photo Interpretation Section.
6. Drawing.
7. Administrative.

MAIN ACHIEVEMENTS:

1. The most outstanding achievement of this organisation is bringing out of the Hindi edition of the National Atlas of India in record time-within a year of the establishment of the organisation.
2. It is busy preparing the maps for the main English edition of the national Atlas which would eventually comprise of 300 plates of maps. The maps in this edition are carefully designed to depict all aspect of the complex natural environment of the country and its socio-economic structure on much greater detail than ever attempted.

3. In course of this voluminous cartographical works spread over years now, a great deal of mappable data and other geographical information relating to all parts of the country have been collected, which are also being used for purposes other than the preparation of National Atlas maps above.
4. The Organisation has prepared quite a large number of maps and charts for Regional Transport Survey of the Planning Commission.
5. A novel scheme of short term employment to university geography students, so as to impart practical training in mapping, specially during the vacations, has been introduced by the Organisation.

RESEARCH FACILITIES AND EQUIPMENTS:

1. A number of modern equipments for map drawing.
2. Photoprinting and handprinting machines.
3. Stereo-scopes to take aerial photographs.
4. Number of other instruments for calculating areas measuring lengths, enlarging and reducing maps.

PUBLICATIONS:

So far the Organisation has published nearly 300000 copies of the English edition maps, apart from the maps of the Hindi edition. All these maps have attracted attention of the experts of different countries.

PLACE IN COUNTRY'S DEVELOPMENT:

Maps are said to be the tools of the Planners. Our maps depicting all aspects of the natural environments of the country and its socio-economic structure in detail have already become a valuable consultant not only to the Planners but also to those interested in administration education, industry and trade. Thus our contributions have made a premier place in the country's planned all-round development.

4. NAME OF THE INSTITUTION ARCHAEOLOGICAL SURVEY OF INDIA, NEW DELHI-11.

YEAR OF ESTABLISHMENT: 1892

NAME OF THE DIRECTOR: Shri A. Ghosh

AIMS AND FUNCTIONS:

The Archaeological Survey of India is responsible for the preservation of ancient monuments of national importance and for undertaking exploration and archaeological excavations.

STAFF:

Gazetted	62
Non-Gazetted	1,989

5. NAME OF THE INSTITUTION ZOOLOGICAL SURVEY OF INDIA,
34, CHITTARANJAN AVENUE, CALCUTTA-12.

YEAR OF ESTABLISHMENT: 1916

NAME OF THE DIRECTOR: Dr. Atma Prakash Kapoor

AIMS AND FUNCTIONS:

1. To undertake faunistic surveys, in order to acquire knowledge of the variety and geographical distribution of the Indian Fauna.
2. To maintain and look after the national zoological collections.
3. To maintain and improve the zoological public galleries of the Indian Museum.
4. To act as a bureau of information on systematics, field ecology and zoogeography of India.
5. To advice the Government of India on all matters connected with the science of zoology.

STAFF:

Scientists.	184
Auxiliary Technical	313
Administrative (including class IV)	154
Total.	651

MAIN DIVISIONS:

There are 11 Divisions in the Headquarter each under charge of a Superintending Zoologist assisted by a few specialists and other technical staff. These are:

- (i) Lower Invertebrate Division;
- (ii) Higher Invertebrate Division;
- (iii) Entomology Division;
- (iv) Lower Chordata Division;
- (v) Higher Chordata Division;
- (vi) Paleozoology Division;
- (vii) Publication Division;
- (viii) Identification and Advisory Division;
- (ix) Ecology and Wild Life Division;
- (x) Field Survey Division; and
- (xi) Marine Survey Division.

Besides the Survey has also established 7 Regional Stations in the country on zoo-geographical basis to study the regional fauna. They are located at Shillong (Assam), Poona (Maharashtra), Jabalpur (M.P.), Jodhpur (Rajasthan), Dehra Dun (U.P.), Madras (Madras) and Patna (Bihar).

MAIN ACHIEVEMENTS:

The Survey maintains and develops the National Zoological Collections which contain well over 7,23,000 authentically identified specimens comprising over 51,000 species of all groups of animals from tiny unicellular form to elephants and whales. During the last half century of its existence, the Survey has discovered hundreds of new species, genera and families of almost all animal groups. With the assistance of the scientists of Department, it has been possible to carry out over 320 extensive surveys covering practically the whole of India including area now in Pakistan, Burma and Nepal.

Among the notable investigations carried out by the Survey mention may be of the following: cause of spread of Schistosomiasis (a serious human disease) in India as a result of the Indian troops returning heavily

infected with the disease from West Asia during the First World War; exploitation of fishery resources of Indawgyi river in Burma; shell fisheries of Andaman and Nicobar Islands; biological survey of Pulta Water Works and study of organisms inhabiting the filter beds and responsible for clogging them and the field investigations in the Assam and Burma war theatre (during the Second World War) on the mammalian reservoirs of (Scrub typhus) disease. Currently, the survey is also collaborating with the army authorities in the NEFA region in important biological investigations. As a result of these studies; over a thousand research papers and monographs have been published.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Survey has been recognised as a centre for basic Taxonomy research in Zoology and maintains one of the largest and oldest zoological libraries. Bonafide research workers are provided facilities to use the library. Through loan of reference material, literature and provision of necessary guidance in its laboratories, it endeavours to make scientists of the highest quality. It also associates university students with the field survey parties of the Survey to give them field training, and offers a number of fellowships and scholarships.

PUBLICATIONS:

The Survey issues the following publications in English:

- i. Records of the Zoological Survey of India, a Journal of Indian Zoology.
- ii. Memoirs of the Zoological Survey of India, devoted to zoological research.
- iii. Fauna of India series of monographs (Books).
- iv. Annual Reports of the Zoological Survey of India.

PLACE IN COUNTRY'S DEVELOPMENT:

The important place occupied now a days by the applied research in agriculture, forestry, public health, medicine and veterinary sciences in the country's development cannot be over-emphasised. Taxonomic studies are correlated to the application of scientific knowledge. The Zoological Survey of India plays an important role by providing basic, fundamental knowledge on the taxonomy and ecology, etc., to agriculture, veterinary and allied sciences, where the country's development is measured by applied nature of work.

6. NAME OF THE INSTITUTION SURVEY OF INDIA, P.O. BOX 37,
DEHRADUN (U.P.)

YEAR OF ESTABLISHMENT: 1767¹

NAME OF THE DIRECTOR:

Survey of India is headed by the Surveyor General of India. The present Surveyor General of India is Brigadier J.S. Paintal, M.I.S., M.I.E.,

AIMS AND FUNCTIONS:

1. All geodetic control (horizontal and vertical) and geodetic surveys (including tide predictions for 40 ports, in Indian Ocean, Arabian Sea and Bay of Bengal, in the region from Suez to Singapore) and allied geophysical Surveys.
2. All topographical control, surveys and mapping within India.
3. Mapping and production of geographical maps and aeronautical charts.
4. Surveys for development projects.
5. Survey of Government forests, cantonments, large scale city surveys, guide maps etc.
6. Survey and mapping of special maps e.g., riverain areas, and geographical explorations authorised by the Government of India.
7. Spellings of geographical names.
8. Demarcation of the external boundaries of the Republic of India, their depiction on maps published in the country and also advice on the demarcation of inter-State boundaries.
9. Training of officers and staff required for the **Organisation** trainees from Central Government Departments and States and trainees from foreign countries as are sponsored by the Government of India.
10. Development and research in cartography, geodesy, photogrammetry and topographical surveys.

In addition to the above responsibilities, the Survey of India renders advice and information on all kinds of survey and cartographic matters practically to all the Ministries and Departments of the Government of India as well as other organisations requiring their services, such as Ministries of Defence, External Affairs, Home Affairs, Food and Agriculture, Iron and Steel, Irrigation and Power, Health and Family Planning, Mines and Metals, Railways, Transport and Civil Aviation etc. of the Government of India; Departments of Communication, Tourism, Natural

Gas Commission, Soil Survey Organisation, Land Records and Revenue Survey Departments of the State Governments; Universities, Municipal Committees and Corporations, Town Improvement Development Organisations.

STAFF:

The Survey has got a sanctioned strength of 525 Gazetted Officers (including Military Service Cadre), 70 parties, 9 drawing offices, 11 regional directorates besides the units under the United Nation Special Fund Project, Indian Photo-interpretation Institute and the Military Survey. Each directorate controls 8 parties on an average. Its total field establishment of all ranks is about 20,000 persons.

MAIN DIVISIONS:

1. Surveyor General's Officer:- It keeps an overall control on the activities of the component directorates of the department.
2. Map Publication Office: It deals with the mapping policy of the department and controls a drawing office, printing establishments and Map Sales Offices.
3. Geodetic and Research Branch: Is responsible for geodetic framework of the country including precision levelling, observations/predictions of tides, magnetic and gravity observations. It also controls publications of the allied data.
4. Regional Directorates: They control survey and mapping of departmental/extra-departmental sheets in their respective areas of responsibility. At present there are eleven Regional Directorates.
5. Directorate of Survey (Air): This directorate is responsible for surveying and mapping of the requirements of IAF and is also responsible for certain geographical mapping.
6. Indian Photo-interpretation Institute: This Institute imparts training in interpretation of aerial photographs on various disciplines such as forestry, soil, geology, underground water, etc.
7. Pilot Production and Training Centre: This is responsible for training of officers for survey work.

MAIN ACHIEVEMENTS:

1. Made revenue surveys in the richer districts as an aid to the operation of settlement surveys.
2. Collected survey data for multipurpose projects to increase the resources of the country in both food and power.
3. Collected survey data to enable the engineers to make preliminary assessments for the canals, dams, distributaries etc.
4. During the first Plan period 70% of the departmental survey potential had to be diverted to the surveys of the different development projects as the work involved was colossal and its completion urgent. During the second Plan period, the demands for development project surveys continued to increase and the Survey of India met these demands, going all out and working at war-footing. During the third Plan these surveys increased even further and in the fourth Plan these projects are expected to be many more.
5. Executed the great Trigonometrical Survey.
6. Laid sound and secure foundations of scientific surveys in India.
7. Made discovery and determination of the height of the highest mountain peak in the world e.g. Mount Everest.
8. Made valuable contribution to the famous theory of Isostasy.
9. Developed Indian clinometer and the refinement of the Planetable.
10. Developed Hunter Short Base - an apparatus used in the topographical control work.
11. Printed the first postage stamps.

RESEARCH FACILITIES AND EQUIPMENT:

...This Survey has got all necessary instruments/equipment required for surveying, mapping, photogrammetric plotting and printing. This department keeps abreast with various technical developments in the sphere, from various countries and such methods, which suit this country are adopted from time to time. Research work in this organisation.

is done pari passu with the production work and is organised on combined basis rather than on individual basis.

PUBLICATIONS:

The survey has published five big volumes of the "Historical Records of the Survey of India" by R.H. Phillimore.

PLACE IN COUNTRY'S DEVELOPMENT:

The Survey of India has an important role towards development of the country. It provides basic survey data for the construction of various irrigation, power and defence projects, etc., which enables the engineers to make preliminary assessments. The significance of the Survey of India is increasing with the growing involvement of the Government in development and defence activities.

(B) INSTITUTIONS UNDER THE C.S.I.R.

The Council of Scientific and Industrial Research was established in 1942, by the Government of India, as an autonomous body registered under the Registration of Societies Act XXI of 1860. It administers the Industrial Research Fund, to which contributions are made by the Government of India from year to year.

The functions assigned to the Council are:

- (a) Promoting, guidance and co-ordination of scientific and industrial research in India, including the institution and the financing of specific researches.
- (b) Assisting establishment or development of special institutions or departments of existing institutions for scientific study of problems affecting particular industries and trades.
- (c) Establishment and award of research studentships and fellowships.

- (d) Utilisation of the results of researches conducted under the auspices of the Council towards the development of industries in the country and the payments of a share of royalties arising out of the development of the results of research to those who are considered as having contributed towards the pursuit of such research.
- (e) Establishment, maintenance and management of laboratories, workshops, institutes and organisations to further scientific and industrial research and to utilise and exploit for purposes of experiment any discovery or invention likely to be of use to Indian industries.
- (f) Collection and dissemination of information in regard not only to research but to industrial matters generally.
- (g) Publication of scientific papers and a journal of industrial research and development.
- (h) Such other activities as promote generally the objects of the Council.

Governing Body - The administration of the Council is vested in the Governing Body, of which the Prime Minister is the President, and the Minister of Education, the Vice-President. The Governing Body of 30 members is composed of eminent scientists, industrialists and administrators. Some of them are also members of its main advisory body - the Board of Scientific and Industrial Research, this common membership has been particularly helpful in facilitating the consideration of technical matters by the Governing Body in their proper perspective. A representative of the Ministry of Finance is a nominated member of the Governing Body.

The management of the affairs and funds of the Council is vested in the Governing Body, subject to such limitations in respect of expenditure as the Central Government may from time to time impose.

The Director-General, Scientific and Industrial Research is the principal executive Officer of the Council. He is responsible for the day-to-day administration of the Council and exercises supervisory control over its technical and research activities, including the work of the National Laboratories and research under the grant-in-aid schemes. He is a member of the Governing Body, the Board of Scientific and Industrial Research, Executive Councils of National Laboratories and other research committees as also of standing and ad hoc committees of the Council.

There are nine technical units at the C.S.I.R. head-quarters, viz.

- (i) Central Design and Engineering Organisation.
- (ii) Directorate of Research coordination and Industrial Liaison.
- (iii) Defence Coordination Unit.
- (iv) Patents Unit.
- (v) Research Survey and Planning organisation.
- (vi) International Scientific Collaboration Bureau.
- (vii) Directorate of Scientific and Technical Personnel.
- (viii) Indian National Scientific Documentation Centre.
- (ix) Publications and Information.

The C.S.I.R. has under it 28 national laboratories and 2 research centres. A description of the laboratories is given in the following pages.

1. NAME OF THE INSTITUTION CENTRAL BUILDING RESEARCH INSTITUTE,
ROORKEE

YEAR OF ESTABLISHMENT: 1953

NAME OF THE DIRECTOR: Shri Dinesh Mohan

AIMS AND FUNCTIONS:

1. To carry out research on all aspects of building construction and allied branches of civil engineering.
2. Assisting government organisations in formulation of standards for the guidance of constructional agencies.
3. Research in Soil mechanics and foundation engineering in relation to buildings and allied structures, building materials, building elements and operations etc.

STAFF:

Scientists	55
Engineers	1
Other technical staff	137
Administrative staff	140
Total	333

MAIN DIVISIONS:

1. Building and Materials.
2. Soil Engineering.
3. Building Processes, Plant and Productivity.
4. Efficiency of Buildings.
5. Architecture.
6. Information and Survey.
7. Extension.

MAIN ACHIEVEMENTS:

1. Soil mechanics and foundation engineering-suggests remedies for defects subsequent to construction.

2. Building materials - e.g. special cements such as supersulphated by drophobic and expanding cements.
3. Prefabricated structures.
4. Functional efficiency and comfort conditions in buildings.
5. Development of cheaper roofing units, thin cavity walls and Rec frames for doors and windows.

PLACE IN COUNTRY'S DEVELOPMENT:

With the large scale building activity in the country the Institute is providing expert know-how and advice to government and industrial agencies on the utilisation of low-cost materials for building construction, structural design foundation engineering, thermal comfort and efficiency of buildings etc. With the pressing need for prefabricated housing, the Institute has an important role to play in improving productivity in building industry.

2. NAME OF THE INSTITUTION CENTRAL DRUG RESEARCH INSTITUTE,
CHATTAR MANZIL PLACE, LUCKNOW.

YEAR OF THE ESTABLISHMENT: 1951

NAME OF THE DIRECTOR: Dr. M.L. Dhar

AIMS AND FUNCTIONS:

1. To find out effective drugs for treatment of diseases prevalent in India. These include drugs derived from indigenous medicinal plants antibiotics and synthetic chemicals.
2. To develop know-how for production of drugs from raw materials available in India.
3. To provide technical assistance to pharmaceuticals and drugs industry in regard to the methods of production and standardisation; and
4. To train young scientists in various aspects of drug research including pharmacognosy, medicinal Chemistry biochemistry, biophysics, microbiology, farm products, experimental medicine and endocrinology.

STAFF:

Scientists	98
Engineers	3
Other technical staff	157
Administrative staff	73
Total	<u>331</u>

MAIN DIVISIONS:

1. Medicinal Chemistry.
2. Biochemistry.
3. Biophysics.
4. Endocrinology.
5. Microbiology.
6. Pharmacology.
7. Antibiotics.
8. Chemotherapy.
9. Experimental medicine.
10. Process development.
11. Analytical wing.

MAIN ACHIEVEMENTS:

1. A potent neuro-muscular blocking agent.
2. Synthesising and screening of organic chemical compounds for pharmacological activity.
3. Economic processes for production of protein hydrolysates, yeast hydrolysates, albumin, peptone, vitamin "E" concentrate, cardiac glycosides, rutin and hesperidin.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has a vital role to play in the critical appraisal and evaluation of vegetable and synthetic drugs and development of remedies for the diseases prevalent in the country.

3. NAME OF THE INSTITUTION CENTRAL ELECTRONICS ENGINEERING RESEARCH INSTITUTE, PILANI.

YEAR OF ESTABLISHMENT: 1953

NAME OF THE DIRECTOR: Dr. Amarjit Singh

AIME AND FUNCTIONS:

1. To undertake research and development work in electronic engineering with a view to providing technical know-how to the industry in their problems
2. Promotion of electronics research particularly in the fields of special purposes vacuum tubes, acoustics and audio engineering, electronic instrumentation.

STAFF:

Scientists	55
Engineers & Economists	7
Administrative	37
Auxiliary Technical	135
Total	<u>234</u>

MAIN DIVISIONS:

1. Audio Engineering and Acoustics.
2. Communication Systems.
3. Electronic Instrumentation.
4. Solid State Devices.
5. Vacuum Tubes.
6. Industrial Engineering; and
7. Industrial Liaison.

MAIN ACHIEVEMENTS:

- (i) Audio engineering and acoustics-moving coil and condenser microphones.
- (ii) Partly transistorised sound level.

- (iii) Controlling reverberation of sound and reduction of noise in theaters and Auditoria.
- (iv) Multicavity magnetrons.
- (v) A three - port -stripline y-junction circulator.
- (vi) Testing of X enon filled flash tubes.
- (vii) Printed circuits.
- (viii) R.F. signal generator.
- (ix) A digital frequency meter.
- (x) T.V. Sets.
- (xi) Micro-wave components.
- (xii) Germanium junction diodes.
- (xiii) High conductance silicon diodes.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has a vital role in the development of indigenous electronics and communication industry, particularly TV manufacture, production of printed circuits, semi-conductors and transistors.

4. NAME OF THE INSTITUTION CENTRAL ELECTRO-CHEMICAL RESEARCH INSTITUTE
KARAIKUDI-3.

YEAR OF ESTABLISHMENT: 1953

NAME OF THE DIRECTOR: Dr. H.V.K. Udupa

AIMS AND FUNCTIONS:

1. Research on problems of electro-chemical industries including electro-metallurgy, electro-deposition and the allied problems such as corrosion and its prevention.
2. Conducting training courses in electroplating, battery technology, corrosion prevention etc.

STAFF:

Scientists	120
Engineers	1
Other technical staff	295
Administrative staff	92
Total	<u>508</u>

MAIN DIVISIONS:

1. Electrothermics.
2. Electrometallurgy.
3. Electro - organic Chemicals.
4. Electro - inorganic Chemicals.
5. Metal Finishing.
6. Corrosion.
7. Batteries.
8. Fundamental Research.
9. Solid State Chemistry.
10. Instrumentation.
11. Information.
12. Operational Research.

MAIN ACHIEVEMENTS:

1. Processes for production of cuprous oxide, aminophenols, salicylaldehyde, calcium gluconate, electrolytic refining of scrap reclaimed tin, synthetic cryolite, electrolytic capacitors and corrosion prevention.
2. Sodium metal.
3. Magnesium metal.
4. Dry Cells.
5. Improved copper oxide cells.
6. Lead dioxide coated anodes.
7. Corrosion protection.
8. Calcium Carbide.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory's researches in electro - chemistry will help development towards the important metals such as aluminium, manganese, magnesium. It will also help in the expansion of electrolytic processes for production of more and more organic chemicals required in industry.

5. NAME OF THE INSTITUTION CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE,
P.O. V.V. MOHALLA, MYSORE.

YEAR OF ESTABLISHMENT: 1950

NAME OF THE DIRECTOR:

Dr. H.A.B. Parpia

AIMS AND FUNCTIONS:

1. To prevent the heavy loss of foodgrains and other perishables which occur in the country.
2. To assist the development of food processing industry.
3. To develop new processes for preservation and packaging of indigenous raw materials at prices within the reach of the common man, and
4. To undertake longrange research and development work in food science and technology.

STAFF:

Scientists.	96
Scientific Assistants.	151
Other technical staff.	167
Administrative staff	127
Total	<u>541</u>

MAIN DIVISIONS:

1. Fruit and Vegetable Technology.
2. Meat, Poultry and Fish Technology.
3. Cereal and Protein Food Technology.
4. Spices and Flavour Technology.
5. Fermentation Technology and Sanitation.
6. Infestation Control.
7. Nutrition and Bio-chemistry.
8. Food Engineering and Process Development.
9. Industrial Research, Consultancy and Extension.
10. Advanced Training and Refresher Courses.

CITRI Experiment Stations:

1. Bhavan's College Campus
Andheri (West),
Bombay-58.

2. Gole Bungalow,
Nelson Square,
Nagpur-1.
3. Anantharajupet P.O.,
Kodur
Cuddapah district.
4. c/o Regional Research Laboratory
Canal Road,
Jammu (Tawi)
5. Krishnasdas Niwas,
Shornur Road,
Thiruvambadi,
Trichur-1.
6. Pilot Plant Building of CDRI
opposite to High Court,
Lucknow-1.
7. Naubahar, Simla-2.
8. Govt. Ice Factory Buildings,
Hoige Bazar,
Mangalore-1.

MAIN ACHIEVEMENTS:

1. Manufacture of baby food from buffalo milk.
2. Manufacture of edible groundnut flour and
multipurpose food.
3. Durofume Process for protecting stored grains
against insects.
4. Improved techniques of freezing, drying and
canning of fish and production of fish and
meat hydrolysates rich in peptone.
5. Extensive studies of factors relating to
packaging materials and methods for transport
and storage.

PUBLICATIONS:

No. of papers published (1963-65) - 234

No. of papers presented at symposia, conferences etc. -43
c.

Report Submitted = A report was submitted to the
Southern Railways on Identification of the problem
of Southern Railway relating to the prevention of
claims on goods **transferred by** them.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute can help augment the protein the resources and thus help in the removal of protein deficiency prevalent in India. The grave food situation Calls for a vital role on the part of the Institute. It can help in developing know-how for preserving and conserving foods, improving the nutritive quality and storage life of fruits and vegetables, control insects and pests and ensure effective packaging of foods for transport or storage.

6. NAME OF THE INSTITUTION CENTRAL FUEL RESEARCH INSTITUTE,
JEALGORA (Dhanbad).

YEAR OF ESTABLISHMENT: 1950

NAME OF THE DIRECTOR: Dr. A. Lahiri

AIMS AND FUNCTIONS:

Basic and applied research on all aspects of solid, liquid and gaseous fuels from coal. Physical and chemical surveys of Indian coals are conducted through seven coal survey stations under the Institute at Jealgora, Raniganj, Bilaspur, Ranchi, Jorhat, Nagpur and Jammu and two sub-stations at Bistrampur and Singrauli.

STAFF:

Scientists.	81
Engineers.	12
Technical Editors	11
Auxiliary Technical staff.	551
Administrative staff.	134
Total	<hr/> 789 <hr/>

MAIN DIVISIONS:

It has got the following project groups:-

1. Assessment of chemical and physical properties of coal resources and their utilisation potentiality.

2. Preparation, beneficiation and briquetting of coal and briquetting of coal and carbonaceous substances.
3. Pyrolysis of coals to coke, semi-coke, chars for industrial and domestic uses including metallurgical fuels, electro-chemicals industry, production - of thermal power, gasification.
4. Production of special solid fuels, coke fines etc.
5. Combustion of coal and gas.
6. Gasification of coal for manufacture of town gas and synthesis gas and hydrogen, gas purification and reforming.
7. Conversion of coal to oil.
8. Industrial coal chemicals including direct conversion of coal to chemicals by oxidation, Nitration, Halogenation and hydrogenation.
9. Mineralogical studies on inorganic material in natural state in coal and in wastes, fly ash, slages and their utilisation.
10. Production of agricultural chemicals from coal and coal derivatives.
11. Ecology in relation to utilisation of coal for industrial production and human consumption.
12. Operational Research, Energy Survey, Sampling, Information, Liaison, Publicity, Photography, Publication and Library Services.
13. Fundamental and basic objective research on coal, coke, gas, hydrocarbons, catalysts etc.

MAIN ACHIEVEMENTS:

The laboratory has completed a large number of research projects in the following fields:-

1. Suitable blends of prime coking coals with appropriate amounts of non-standard coking coals.
2. Domestic and Industrial Coal.
3. Gasification of Coal.
4. Liquid Fuels.
5. Chemicals from Coal.
6. Briquetting.
7. Asbestos sheets and pipes.
8. Sulphur from pyrites.
9. Investigation of the problem of wasting the mixed difficult coals produced from a number of small mines and seams.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has a vital role to play in the study of utilisation of coal for steel industry, railways and power stations. Another potential role is in the planning and processing of coal for domestic fuels, coal survey, coal gasification - liquid fuels etc.

7. NAME OF THE INSTITUTION CENTRAL GLASS AND CERAMIC RESEARCH INSTITUTE
CALCUTTA.32.

YEAR OF ESTABLISHMENT: 1950

NAME OF THE DIRECTOR: Dr. K.D. Sharma

AIMS AND FUNCTIONS:

Research on different aspects of glass and ceramics, pottery, porcelain, refractories and enamels, development of processes for manufacture of glass and ceramic articles, standardization of raw materials used in the ceramic industry. The Institute's function has been to assist in (1) proper utilisation of the country's resources of raw materials, (2) technological efficiency of production, (3) production of vital strategic materials and eliminating imported materials (4) analysis and standardisation of materials used in the industry.

STAFF:

Scientists.	49
Engineers.	4
Economist.	1
Technical Editors.	1 (one of the scientists)
Other technical staff.	1183
Administrative staff.	89
Total	<u>326</u>

MAIN DIVISIONS:

1. Glass and Ceramics.
2. Pottery.
3. Refractories.

4. Vitreous enamelling.
5. Mica.
6. Porcelain.

MAIN ACHIEVEMENTS:

1. Optical Glass.
2. Foam Glass.
3. Mica Utilisation.
4. Glass Containers.
5. Signal Glass.
6. Ceramic Colours, Glass Electrodes etc.
7. Glazed Bricks for liming irrigation canals.
8. Magnesite for Basic Refractories.
9. Utilisation of Coloured Clays.
10. Substitute for Bora.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has a vital role to play in the assessment of raw materials, development of new types of optical glass, standardisation and aspects of technological efficiency.

8. NAME OF THE INSTITUTION CENTRAL INDIAN MEDICINAL PLANTS ORGANISATION,
LUCKNOW.

YEAR OF ESTABLISHMENT: 1959

NAME OF THE DIRECTOR: Dr. K. Ganapathi

AIMS AND FUNCTIONS:

1. To support the present activities in the field of medicinal plants carried out by government and private agencies.
2. To develop the existing medicinal and aromatic plant resources of India.
3. To bring under cultivation some of the important medicinal and aromatic plants in great demand.

4. To introduce the cultivation in the country of exotic medicinal plants of high yielding active content.
5. To coordinate the activities in the development of cultivation and utilization of medicinal plants on organised basis.

STAFF:

	Headquarters	Bangalore	Haldwani
Scientists and Technologists	10	9	2
Technical Auxiliary	10	8	8
Administrative	<u>21</u>	<u>5</u>	<u>2</u>
Total	41	22	12

MAIN DIVISIONS:

The Organisation has two zonal centres, one at Bangalore and the other at Haldwani (U.P.).

MAIN ACHIEVEMENTS:

1. Preparation of list of 26 important medicinal and aromatic plants whose large scale production was considered important from the point of internal consumption.
2. Survey of suitable sites for advising the states in regard to large scale cultivation of medicinal and aromatic plants.
3. Large scale production of linaloe oil glycyrrhiza glabra and Mentha arvensis.
4. Production of citronella oil.
5. Work on the production of oil of davana, geranium, mentha and patchovli.
6. Cultivation of about 300 acres of medicinal and aromatic plants at Haldwani.
7. Experimental cultivation of medicinal and aromatic plants in Assam.
8. Cultivation of Rauvolfia serpentina, geranium, Bursera delpechiana and Artemisia pallens in Coorg.

9. Acquisition of two factories for processing drugs and aromatic plants.
10. Acquisition of 600 acres of Raulvolfia cultivation at Kalady.
11. Cinchona and noncinchona plantations at Madras.

PLACE IN COUNTRY'S DEVELOPMENT:

The large Scale cultivation and also the processing activities have helped industry with raw materials and extracts for drugs and perfumery manufacture and also materials for export.

9. NAME OF THE INSTITUTION CENTRAL LEATHER RESEARCH INSTITUTE,
ADAYAR, MADRAS-20.

YEAR OF ESTABLISHMENT: 1953

NAME OF THE DIRECTOR: Dr. Y. Nayudamma

AIMS AND FUNCTIONS:

Development of processes for improvement of raw hides and skins, tanning techniques and materials, know-how for production of industrial leathers and short-term leather training courses.

STAFF:

Scientists.	54
Engineers.	2
Economists.	6
Auxiliary technical staff	109
Administrative staff.	64
Total	<hr/> 285

MAIN DIVISIONS:

1. Chemical Laboratory.
2. Biophysics.
3. Biochemistry.
4. Bacteriology.
5. By - products.
6. Organic Chemistry.

7. Microscopy.
8. Physical Testing.
9. Biopolymer.
10. Auxiliaries.
11. Tannery.
12. Pilot Plants.
13. Leather Goods.
14. Engineering.
15. Economics.

MAIN ACHIEVEMENTS:

1. Cutting down imports.
2. Export promotion.
3. Better utilisation of indigenous materials.
4. Substitutes - e.g., Tobacco seed oil for fish oil.
5. By-products utilisation.
6. Process improvement.
7. New products and improved products. e.g. dry, ready-to-wet sausage casings from mammalian intestines, jointed casing using edible adhesive, garment and glove leather using buffalo calf skins etc.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory has potentiality of contributing in the production of improved leather and sports goods for export, fuller utilisation of indigenous materials for leather finishing etc.

10. NAME OF THE INSTITUTION CENTRAL MECHANICAL ENGINEERING RESEARCH INSTITUTE, BURGAPUR-9.

YEAR OF ESTABLISHMENT: 1958

NAME OF THE DIRECTOR: Dr. M.M. Suri

AIMS AND FUNCTIONS:

1. Research in mechanical engineering in all its aspects.
2. Design of equipment on the basis of research work
3. Design, development and manufacture of pilot plants and prototypes.

4. Investigations on materials for the manufacture of machine tools and machinery, standardisation of such materials and finished components and assistance in formulation of specifications.
5. Training specialists and designers in mechanical engineering.

STAFF:

Scientists.	19
Engineers.	66
Technical Editors.	1
Other technical staff.	424
Administrative staff.	75
Total	<u>585</u>

MAIN DIVISIONS:

1. Air-conditioning and Refrigeration.
2. Automobiles.
3. Computer.
4. Designs.
5. Hydraulic Transmission.
6. Mechanical Equipment for Chemical and Petroleum Plants.
7. Heat Transfer and Fluid Mechanics.
8. Instrumentation.
9. Internal Combustion Engine.
10. Materials.
11. Metrology.
12. Power Engineering.
13. Production Engineering.
14. Structures.
15. Technical Information and Liaison.
16. Vibration and Noise Control.
17. Welding.

MAIN ACHIEVEMENTS:

1. Steel structure for reduction of steel requirement.
2. Flake ice machine for food preservation, fish and milk transportation, concrete mixing to accelerate hardening in chemical industries, medicine and surgery.
3. Automotive filters.

4. Pulverisation - a new grinding technique for pulverising coal, minerals and cereals.
5. Intensive research on the dimensional instability of castings and forgings used for machine and gauge making.
6. Materials testing.
7. Destructive testing - tensile testing of metals, compressive tests, shear and bend tests, fatigue tests, hardness tests etc.
8. Non-destructive tests - X-ray and gamma radiography, ultrasonic flaw detection and crack detection.
9. Stress analysis of complicated shapes with notches, holes, bends etc.

PLACE IN COUNTRY'S DEVELOPMENT:

The work of the Institute will helpⁱⁿ providing indigenous know-how in design, structural analysis, production, testing and standardisation.

11. NAME OF THE INSTITUTION CENTRAL MINING RESEARCH STATION,
DHANBAD

YEAR OF ESTABLISHMENT: 1955

NAME OF THE DIRECTOR: Dr. K.M. Sinha

AIMS AND FUNCTIONS:

To investigate problems of mine working and mining method, safety in mines of persons and equipment in respect of coal and metalliferous mines, efficiency of mining operations, mining equipments and mining personnel and testing of equipment in respect of safety and efficiency.

STAFF:

Scientists.	61
Other Technical Staff.	211
Administrative staff.	51
Total	323

MAIN DIVISIONS:

1. Mining Technology Group.
2. Mine Safety Group.
3. Mine Health Group.
4. Mine Engineering Group.
5. Pollution of Mine Air Group.

MAIN ACHIEVEMENTS:

1. Flame-proof electrical equipment.
2. Conveyor belts.
3. Gallery testing facilities for helping manufacturers in testing explosives and detonators.
4. Gas and dust analysis.
5. Pan testing.
6. Remedial measures for manganese poisoning.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has a vital role in providing improved mining techniques and equipment. The practicability of working, for instance, long wall system of mining in Indian coal mines is engaging the attention of the Institute.

12. NAME OF THE INSTITUTE CENTRAL PUBLIC HEALTH ENGINEERING RESEARCH INSTITUTE, WARDHA ROAD, NAGPUR-3.
YEAR OF ESTABLISHMENT: 1958
NAME OF THE DIRECTOR: Prof. M.V. Bopardikar

AIMS AND FUNCTIONS:

1. Treatment of sewage water and industrial wastes and water works engineering.
2. Research in all aspects of public health engineering and co-ordination of work of all interested agencies in this field in the country.
3. River and stream pollution survey, effluent treatment and disposal.
4. Rural sanitation.
5. Air pollution, industrial hygiene and radiological health.

STAFF:

Scientists.	74
Engineers.	23
Other technical staff.	215
Administrative staff.	147
Total	459

MAIN DIVISIONS:

1. Molecular Biology.
2. Instrumentation.
3. Air Pollution.
4. Engineering.
5. Workshop.
6. Rural Sanitation.
7. Sanitary Chemistry and Industrial Waste.
8. Bacteriology.
9. Tile Unit and Training.
10. Library

Field centres of the Institute - Eight field centres of the Institute are functioning at Calcutta, Delhi, Bombay, Hyderabad, Ahmedabad, Kanpur, Jaipur and Bhopal. Besides there are three field units at Bombay, Jabalpur, Poona and an Enteric Virus Research laboratory at Poona.

MAIN ACHIEVEMENTS:

1. Water supply treatment and water engineering.
2. Extensive studies on flash mixing, flocculation, coagulation and sedimentation for evolving a speedy and economic process.
3. Studies regarding aspects of designing filters, such as turbidity, effective size and uniformity coefficient, use of filter media-sand, anthracite-sand mixed bed, anthracite, activated coal, under-drains and their economics, diatomaceous filter etc. Studies regarding water distribution systems.
4. Demineralisation.
5. Defluoridation.
6. A 'gobar' fuel gas plant.

The Institute's work will help the municipal authorities in planning the water treatment and supply, sewage disposal and effluent treatment and discharge techniques.

1. Soils.
2. Concrete.
3. Bitumen.
4. Roads.
5. Bridges.

6. Traffic.
7. Extension.
8. Information and Operational Research.

MAIN ACHIEVEMENTS:

1. Low-cost road construction.
2. Stabilisation of black cotton soils.
3. Puzzolanic materials.
4. Use of aggregates.
5. Use of low-temperature tar.
6. Waterproofing of irrigation channels.
7. Traffic survey.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute is playing a potential role in planning and construction of low cost roads, utilisation of local materials in road construction and traffic survey and safety techniques.

14. NAME OF THE INSTITUTION CENTRAL SALT AND MARINE CHEMICALS RESEARCH INSTITUTE, WAGHADI ROAD, POST BOX NO. 38, BHAVNAGAR.

YEAR OF ESTABLISHMENT: 1954

NAME OF THE DIRECTOR: Dr. D.S. Dattar

AIMS AND FUNCTIONS:

1. To work out methods for improvement of salt for domestic and industrial uses.
2. To assist development of salt engineering and mechanisation of the salt industry.
3. To conduct researches on recovery of important chemicals from sea water and marine algae and their utilisation for the manufacture of other products.
4. Utilisation of by-products from marine and lake bitterns.

STAFF:

Scientists.	101	
Engineers.	9	
Technical editor.	1	(Scientist*)
Administrative Staff..	38	
Total	148	

MAIN DIVISIONS:

1. Salt
2. Desalination
3. Marine Chemicals and Fertilisers.
4. Marine Algae
5. Ion Exchange

MAIN ACHIEVEMENTS:

1. Salt engineering - Processes have been developed for production of table salt, dairy salt, iodized salt and AR & BP sodium chloride.
2. Sea water utilisation.
3. Recovery of Sodium, Potassium and Manesium salts.
4. Bromine from sea water.
5. Production of marine algae, agar agar and alginic.
6. Survey of salt industry.
7. Work on corrosion for the preparation of corrosion map of India and also on corrosion studies in sea water concentrates.

PLACE IN COUNTRY'S DEVELOPMENT:

The large resources of sea water provide a useful area for exploitation of valuable chemicals for industrial, medicinal and domestic use. The mechanisation of salt farms will enhance the productivity of the industry and also enable fuller recovery and utilisation of byproducts.

15. NAME OF THE INSTITUTION CENTRAL SCIENTIFIC INSTRUMENTS ORGANISATION, SECTOR-17, CHANDIGARH.

YEAR OF ESTABLISHMENT: 1959

NAME OF THE DIRECTOR:

Dr. P.S. Gill

AIMS AND FUNCTIONS:

1. Survey and assessment of the present and future needs of various instruments required for teaching, research and testing.
2. Adopting steps to create new design and development units and centres of instruments production.
3. Specifications and blue prints for instruments and development of techniques and equipment for testing instruments and production of prototypes.
4. To assist Indian Standards Institution in formulation of standards for instruments.
5. Organisation of advanced training courses for technicians and specialised personnel in fabrication, repair and maintenance of scientific instruments.

STAFF:

Scientists.	45
Engineers.	1
Auxiliary Technical.	98
Administrative staff.	111
Total	255

MAIN DIVISIONS:

1. Electronics and Electricals.
2. Optics.
3. Mechanical.
4. Service and maintenance centres for instruments.

MAIN ACHIEVEMENTS:

1. Setting up of an Indo-Swiss Training Centre for training precision mechanics.
2. Setting up of two maintenance units for servicing of scientific instruments.
3. Designing of optical systems.

4. A scheme for tracing of rays through triple mirrors and tetrahedron prisms has been worked out.
5. A new process for core making has been demonstrated.

PLACE IN COUNTRY'S DEVELOPMENT:

This organisation will play a major role in ~~development~~ of new and regular servicing of ~~scientific~~ instruments.

16. NAME OF THE INSTITUTION INDIAN INSTITUTE OF EXPERIMENTAL MEDICINE
4, RAJA S.C. MULLICK ROAD, CALCUTTA - 32.

YEAR OF ESTABLISHMENT: 1956

SCIENTIST-IN-CHARGE: Dr. A. Banerjee

AIMS AND FUNCTIONS:

Research in various aspects of biochemistry as applied to medicine, bacteriology etc.

The scope covers biochemistry, microbiology, physiology and immunology.

STAFF:

Scientists.	29
Other Technical staff.	34
Administrative staff.	10
Total	73

MAIN DIVISIONS:

1. Cholera infections and immunisation.
2. Experimental neuro-psychiatry.
3. Experimental carcinogenesis.
4. Hormone metabolism.
5. Thyroid disorders.
6. Experimental therapeutics.

MAIN ACHIEVEMENTS:

1. Studies on proteins and enzymes (a) Precipitation of medicinal quality ~~amylase~~ (b) Preservation of

- amylase in freeze - dried-state(c) Antiviral and antitumour antibiotic .
2. Studies in Hormone metabolism and its function in health and disease.
 - (a) Effect of plant products on sex hormones.
 - (b) Effect of Coumarin derivatives of plant origin on estrogenic and gonadotrophic hormones.
 - (c) Effect of Coumarin compounds on estrogen activity.
 3. Studies on cholera - infection and cholera - immunization.
 - (a) Studies on the rationale of the use of cholerae bacteriophage for prophylaxis and treatment.
 - (b) Studies on the potentiation of cholera-vaccine.
 - (c) Biochemical and genetic studies on variations in the properties of vibrio.
 - (d) Studies on the mechanism of antibiotic action on vibrio cholerae.
 4. Biochemical and serological studies on acid-fast organisms.
 5. Nutritional, Metabolic and Immunology studies on protozoal parasites.
 6. Biochemical mechanism of active ion transport in animal tissues.
 7. Studies on Collagen Metabolism and Fibrogenesis.
 8. Studies in the Biological Basis of Vascular disease.
 9. Studies in the chemistry of Indian medicinal plants.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has a vital role in experimental medicine including biochemical and pharmacological studies to help search for effective preventives and cures. The Institute is also conducting studies on neuro-psychiatry.

17.

NAME OF THE INSTITUTE

INDIAN INSTITUTE OF PETROLEUM,
DEHRA DUN

YEAR OF ESTABLISHMENT:

1959

NAME OF THE DIRECTOR:

Dr. M.G. Krishna

AIMS AND FUNCTIONS:

Research and developmental work on the petroleum and natural gas and in the field of petrochemicals, technoeconomic and market studies and provision of facilities for training of personnel for the petroleum industry.

STAFF:

Scientists/Engineers.	64
Scientific Assistants.	62
Other technical staff.	157
Administrative Staff.	59
Total	242

MAIN DIVISIONS:

1. Refining.
2. Petrochemistry.
3. Products Application.
4. Projects.
5. Training.
6. Coordination and Information.
7. General Technical Services.

MAIN ACHIEVEMENTS:

1. Evaluation of Indian crude oil samples, standard testing of petroleum products, research on processing of crude oil, preparation of petrochemicals, utilisation of end-products, preparation and improving of combustion of low grade kerosene and tests on domestic heating appliances..
2. Techno-economic and market surveys on demand.
3. Utilisation of surplus naphtha.
4. Utilisation of waxy residues and toluene.
5. Reclamation of used lubricating oils.
6. Cold chamber.
7. Liquid paraffin from used turbine oil.
8. Lube oil cuts from Kalol crude have been treated with silica gel and tested.
9. Autoclave for hydrogenation to yield superior kerosene.
10. Post-graduate training courses.

MAIN ACHIEVEMENTS:

1. The laboratory has successfully completed the work on the design and engineering aspects of the 4 ft. x 4 ft. trisonic wind tunnel and associated equipment such as a large air receiver system, a unitary compressor-dryer system, cooling tower, wind tunnel instrumentation and data handling system.
2. The compressed air supply and storage system has been fabricated and erected.
3. 1 ft. tunnel.
4. Two types of windmills were designed to suit the Indian wind conditions.

PLACE IN COUNTRY'S DEVELOPMENT:

With the advancing aerospace technology, the laboratory will play a major role in assisting the aircraft industry in developing suitable designs for efficient manufacture and operation of supersonic aircraft. The laboratory will have a vital role in studying nonaeronautical applications of aerodynamics such as wind loads on buildings and structures, drag resistance of ground vehicles, design of ventilators, smoke dispersal, air resistance in mine shafts, pneumatic systems, etc.

19. NAME OF THE INSTITUTION NATIONAL BOTANIC GARDENS, LUCKNOW.

YEAR OF ESTABLISHMENT: 1953

NAME OF THE DIRECTOR: Dr. L.B. Singh

AIMS AND FUNCTIONS:

1. Fundamental and applied research in different phases of Botany, horticultural research and chemical examination of plants for their useful constituents.
2. Extension of plant cultivation.
3. Imparting training in horticultural practices, and advanced botany and giving assistance in the identification of plants, selection of suitable varieties for cultivation, garden layouts and on other aspects of botany and horticulture.

4. Development of medicinal plant resources of India; introduction and large - scale cultivation of economic and medicinal plants of industrial importance.

STAFF:

(a) Scientists.	41
(b) Engineer.	1
(c) Other Technical Staff.	353
(d) Administrative Staff.	180
(e) Senior and Junior Scientific Assistants.	45
Total	620

MAIN DIVISIONS:

1. Plant Morphology.
2. Plant Tissue Culture.
3. Utilization Research.
4. Aromatic and Phytochemistry.
5. Cryptogamic Botany.
6. Horticulture.
7. Floristic Botany.
8. Virology.
9. Viticulture.
10. Pharmacobotany.
11. Cytogenetics.
12. Plant Breeding.
13. Plant Physiology.
14. Plant Propagation and Floriculture.
15. Plant Introduction and Plant and Seed Exchange.
16. Library.
17. Garden.
18. Publications.
19. Research Coordination and Liaison.

MAIN ACHIEVEMENTS:

1. Development of simple and cheap methods for reclamation of vast tracts of 'Usar' lands to make them fertile.
2. Grape cultivation.
3. Weeds of economic utility.
4. Plant lipids.
5. Pharmaceutical grade palmitic acid.
6. Dihydroquercetin.
7. Perfumery agent.
8. Edible lecithin.
9. Cucurbitacin-B.
10. Trilauric and lauric acids.
11. Emulsion for killing angiospermous parasites.

PLACE IN COUNTRY'S DEVELOPMENT:

Chief centre for botanical and horticultural studies
of Indian plants of economic and medicinal value.

20. NAME OF THE INSTITUTION NATIONAL CHEMICAL LABORATORY,
POONA-8.

YEAR OF ESTABLISHMENT: 1950

NAME OF THE DIRECTOR: Dr. B.D. Tilak

AIMS AND FUNCTIONS:

Research concerning all branches of chemistry as applied to the solution of technical problems of industry with due attention to basic research.

STAFF:

Scientists.	275
Other Technical Staff.	204
Administrative Staff.	96
Total.	575

MAIN DIVISIONS:

1. Organic Synthesis.
2. Chemistry of Natural Products.
3. Inorganic Chemistry.
4. Physical Chemistry.
5. Biochemistry.
6. Polymer Chemistry.
7. Chemical Engineering and Process Development.
8. Technical Services.
9. Instrumentation.
10. Engineering Services.
11. Glass Blowing.

MAIN ACHIEVEMENTS:

1. A process for production of vitamin 'C' from sorbose.
2. Bacterial distase.
3. Processes for 4 hyxrodycoumarin.
4. Thermistors.
5. Wax from sisal waste.
6. CNSL resin - coating compositions for textile bobbins, insulating varnishes, can sealing compositions, liquid rubber and rubber based adhesives.
7. Processes for polyurethane printing rollers, rocket fuel binders and foams and styrene-based ion-exchange resins.
8. Processes for manufacture of tetrabromo indigo and thiodiglycol.
9. A process for the manufacture of foundary core oil.

PLACE IN COUNTRY'S DEVELOPMENT:

Projects have been oriented to advance chemical knowledge and to assist chemical industry during the Fourth Plan period. It is providing research chemicals for research laboratories, industries and universities which were imported from abroad.

21. NAME OF THE INSTITUTION NATIONAL GEOPHYSICAL RESEARCH INSTITUTE,
HYDERABAD-9.

YEAR OF ESTABLISHMENT: 1961

NAME OF THE DIRECTOR: Dr. Hari Narain

AIMS AND FUNCTIONS:

1. To encourage and stimulate research in Geophysics and related fields.
2. To cooperate with international agencies.
3. To encourage participation of Indian scientists in the activities of international geophysical agencies and the International Union of Geodesy and Geophysics.
4. To participate in international cooperation projects like the World Magnetic Survey, International Quiet Sun Year and the International Upper Mantle Programme.
5. Correlation of the field data in all fundamental aspects of geology and geophysics with laboratory investigations and the oriental studies.

STAFF:

Scientists.	72
Engineers.	1
Economists.	Nil
Technical Editors.	Nil
Other technical staff.	62
Administrative staff.	33
Total	173

MAIN DIVISIONS:

1. Seismology.
2. Gravity and Isostasy.
3. Geomagnetic and Geoelectricity.
4. Rock mechanics.
5. Palaeomagnetism and Heat Flow.
6. Theoretical Geophysics.
7. Geophysical Prospecting.
8. Geophysical instrumentation.

MAIN ACHIEVEMENTS:

1. Gravity studies of the Indian peninsular shield.
2. Gravity and magnetic survey to delineate geologic structures associated with mineral deposits in the region.
3. Geoelectric studies.
4. Paleomagnetic studies.
5. Heat flow studies.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has a vital role in coordinating objective basic research on the geophysical processes in rocks and mines. An important role will be in geophysical instrumentation for which facilities in India are scarce.

22. NAME OF THE INSTITUTION NATIONAL INSTITUTE OF OCEANOGRAPHY,
7-D HAUZ KHAS, NEW DELHI - 16.

YEAR OF ESTABLISHMENT: 1962

NAME OF THE DIRECTOR: Dr. N.K. Panikar

AIMS AND FUNCTIONS:

1. Research in physical, biological, geological and chemical oceanography including prospecting for petroleum and minerals in sea bed.
2. Research on the problems of defence, fisheries, raw materials from sea, oceanic transportation, sedimentation and erosion on coasts and harbours, shelf and deeper areas, safe disposal of pollutants and radio-active wastes.

STAFF:

Scientists.	46
Engineers.	nil
Economists.	nil
Technical editor.	nil
Other technical staff.	19
Administrative staff.	25
Total	90

MAIN DIVISIONS:

1. Planning and Data Division.
2. Biological Oceanography.
3. Physical Oceanography.
4. Indian Ocean Biological Centre.

MAIN ACHIEVEMENTS:

1. Indian Ocean Biological Centre has been handling all standard net collections of zooplankton from the region and sorting them into major groups.
2. The Indian Ocean Physical Oceanography Centre has instituted studies on coastal erosion and silling in harbours, wave refraction and tidal investigations, coastal currents and sediment movements.
3. The unit for International Biological programme is concerned with problems of research on productivity and ecology of marine and estuarine communities and effects of manmade changes in environment through domestic industrial and radioactive pollutions on the various organisms.
4. The Indian Ocean Data centre handles all data collected and carries out quality check, processes and storesthes.
5. Discovery of a series of submarine valleys/canyons along the continental slope of the east coast of India.
6. Researches of weather processes.

PLACE IN COUNTRY'S DEVELOPMENT:

The sea is a vast mine of wealth and with our limited land resources it is imperative that new searches for mineralogical and biological resources are made in the vast unexplored regions of the sea.

23.	<u>NAME OF THE INSTITUTION</u>	<u>NATIONAL METALLURGICAL LABORATORY, BURMA MINES, JAMSHEDPUR.</u>
	<u>YEAR OF ESTABLISHMENT:</u>	1950
	<u>SCIENTIST-IN-CHARGE.</u>	Dr. T. Banerjee

AIMS AND FUNCTIONS:

Applied and fundamental research on metals and alloys including the processing of indigenous ores and minerals, production of refractories, ferrous and non-ferrous metals and alloys.

STAFF:

Scientists/Technologists.	189
Auxiliary Technical.	373
Administrative staff.	121
Total	683

MAIN ACHIEVEMENTS:

1. Nickel-free alloys.
2. Substitute for copper.
3. Permanent Magnets.
4. Process for the production of ferrites.
5. Ore beneficiation.
6. Upgrading copper ore.
7. Upgrading Fluorspar.
8. Extensive investigation on the low-shaft furnace and the LD process for iron and steel.
9. Upgrading limestones.
10. Development of a process for magnesium metal.
11. Setting up of pilot plant for the production of electrolytic manganese from low grade ore for use in the production of nickel-free stainless steel and another plant for production of electrolytic manganese dioxide for dry cells.
12. Development of a method for reconditioning magnesium powder which has a tendency to be oxidised on storage, by which 99% pure magnesium powder can be obtained.
13. A technique of imparting steel wires and plates protection against corrosion, by hot-dip aluminisation.
14. Extensive work on surface protection and metal finishing to prevent corrosion.

15. Production of refractories for lining industrial furnaces etc.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory has a vital role to play in upgrading and utilising indigenous ores and minerals and developing know-how for alloys. It can also give technical consultancy to government and industry.

24. NAME OF THE INSTITUTION NATIONAL PHYSICAL LABORATORY,
HILL SIDE ROAD, NEW DELHI-12.

YEAR OF ESTABLISHMENT: 1950

NAME OF THE DIRECTOR: Dr. A.R. Verma

AIMS AND FUNCTIONS:

1. Maintains standards for important physical quantities like length, mass and time and derived standards for electrical and electronic instruments, temperature, luminosity and chemicals for special applications.
2. Testing of instruments and materials for their quality and performance and issues test certificates.
3. Carries out research and investigation for developing processes and materials required by industry.

STAFF:

Scientists.	212
Auxiliary Technical.	356
Administrative staff.	127
Total	695

MAIN DIVISIONS:

1. Optics.
2. Acoustics.
3. Solid State Physics.

4. Low Temperature Physics.
5. Theoretical Physics.
6. Electronics.
7. Time and Frequency.
8. Industrial Physics.
9. Heat and Power.
10. Weights and Measures.
11. Electricity.
12. Applied Mechanics.
13. Radio Propagation.
14. Rain and Cloud.
15. Development-Cum-Production of Electronic components.
16. Analytical Chemistry.
17. Glass Technology, and
18. Photography.

MAIN ACHIEVEMENTS:

1. Silvered mica films.
2. Ceramic capacitors.
3. Community receiver.
4. Carbon products.
5. Metal detector.
6. Magnetic fluid.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory is the foremost national institution for pure and applied research in physics and therefore holds a very important place in country's & development.

25. NAME OF THE INSTITUTION REGIONAL RESEARCH LABORATORY,
(JAMMU).TAWI

YEAR OF ESTABLISHMENT: 1941
TAKEN OVER BY CSIR: 1957
NAME OF THE DIRECTOR: Dr. K. Ganapathi

AIMS AND FUNCTIONS:

1. To carry out detailed survey of medicinal, aromatic and other plants of economic importance grown in North-West Himalayan region.
2. To introduce medicinal and aromatic plants from temperate and Mediterranean regions of the world and to acclimatise for large scale cultivation and commercial exploitation in India.
3. To work out chemical production of active principles from medicinal plants.
4. To carry out chemical and pharmacological investigations of these active principles.
5. To investigate local plants, fungicides and soil micro-organisms for production of new and potent anti-microbial and anti-fungal agents.
6. To conduct research on exploitation of coal, lignite, mineral and clay deposits of the region.

STAFF:

Scientists.	116
Engineers.	3
Other Technical Staff.	100
Administrative Staff.	44
Total	263

MAIN DIVISIONS:

1. Applied Microbiology and Antibiotics.
 2. Chemical Technology.
 3. Cytogenetics, Plant Breeding and Agronomy.
 4. Organic Chemistry.
 5. Pharmacology.
 6. Plant Pathology and Entomology.
 7. Plant Physiology and Biochemistry.
 8. Pharmacognosy, Phytochemistry and Survey.
 9. Food Technology.
 10. Mineral and Forest Products
 11. Technical Information.
-

MAIN ACHIEVEMENTS:

1. Diosgenin - Investigations carried out in the Laboratory have shown that tubers of Dioscorea deltoidea, growing in Bhadawah (Kashmir), contain diosgenin which is used as a starting material in the synthesis of cortisone, male and female sex hormones. Diosgenin occurs in the tubers in a concentration of 4-8 per cent. A process for its quantitative recovery has been worked out and leased to a firm in Bombay for commercial exploitation.
2. Jammu mint - A new chromosomal race of menthol-yielding mint, known as Jammu mint, has been evolved from Japanese mint (Mentha arvensis). The new strain is more robust than the parent and puts forth abundant foliage; it contains about 5 per cent of oil which is almost double that of the Japanese mint.
3. Ergot:- Strains of Claviceps purpurea have been obtained, some of which produce mostly ergometrine and some mostly ergotamine in high yields. The strains used in the country previously were all producers of mostly ergotoxin, not used therapeutically. Methods of inoculation of rye have been standardized. In small plots, yields working out to 338 kg. of the sclerotia per acre have been obtained. The alkaloid content of the sclerotia has also been very satisfactory (0.27 to 0.38) per cent.
4. Citric Acid - Strains of Aspergillus niger have been isolated which convert sucrose as such or the cane molasses into citric acid in satisfactory yields in submerged cultures in shake flasks. Some improved strains of this would have been isolated. This will be tried in 100 gallon fermentors in the Pilot Plant under standard conditions. This work will form the nucleus for a set up in the Institute to investigate the processes of manufacture of many other fermentation products of importance now being imported.
A new polyene heptaene - antibiotic, X-2510, reported earlier has been confirmed to be a new one. It shows high antifungal activity and requires detailed study.

5. Solanaceous alkaloids - Methods have been worked out to produce "total belladonna alkaloids", atropine, hyoscyne, homatropine and their salts. These processes are being taken up by our sister Institute, Drug Research Laboratory, Jammu, on a commercial scale. It is planned to manufacture enough of these drugs to stop their imports.
6. Digoxin - Methods for the isolation of crystalline digoxin from Digitalis lanata have been worked out and this will be produced in required quantities in Drug Research Laboratory to meet the needs of the country.
7. Linalool and linalyl acetate - In the course of our search for plant materials yielding essential oils containing predominantly linalool/linalyl acetate, leaves of Skimmia laureola are being tried as a raw material. A survey conducted indicated that this plant occurred in the Jammu and Kashmir State and more abundantly in Punjab and Himachal Pradesh. Its leaves yield an essential oil containing about 70 per cent of linalool and linalyl acetate.
8. Eucalyptus oil - Oil from Eucalyptus citriodora grown in Chatha Farm yielded a very pleasant smelling oil which was found to be rich in citronellol. Its large scale plantation has been taken up in Chakrohi Farm.
9. Edible mushrooms - Two varieties of edible mushrooms have successfully been cultivated in the Laboratory. These methods will be tried on a pilot-plant scale to obtain data for commercial cultivation.
10. Osthol - A coumarin, isolated from an indigenous plant, showed interesting respiratory stimulant properties and has a claim for clinical trial.
11. Surgical plaster of paris - Gypsum available in plenty in the State has been processed in the Laboratory into surgical plaster which is being imported. A pilot production unit is being set up to scale up the process.
12. Mentha Citrata - Steps have been taken to cultivate Mentha citrata which appears to be a promising plant material for producing an essential oil with a high content of linalool and linalyl acetate to work out the economics of production of the oil.

13. Eucalyptus citriodora - The essential oil of eucalyptus citriodora with a high citronellal content has been reduced to give an oil with acceptable properties.
14. Aerosols - A process for dewaxing and refining the crude pyrethrum oleoresin extracted from the pyrethrum flowers in Srinagar Factory (CIMPO) has been worked out. This refined extract has been formulated into aerosols with the metallic containers and spray nozzles obtained from a local firm. The most efficient and sophisticated way of using this insecticide is in the form of aerosols.

RESEARCH FACILITIES AND EQUIPMENTS:

Fairly good facilities and sufficient equipments for the type of the work being carried out at present are available.

PUBLICATIONS:

More than 200 research papers published in various scientific periodicals - all in English language.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory has successfully introduced several species for extraction of aromatic oils, alkaloids, steroids and antibiotics. The laboratory has a potential role to play in country's development.

26. NAME OF THE REGIONAL RESEARCH LABORATORY,
INSTITUTION JORHAT (ASSAM)

YEAR OF ESTABLISHMENT: 1961

NAME OF THE DIRECTOR: Dr. M.S. Iyengar

AIMS AND FUNCTIONS:

1. To investigate problems relating to utilisation of important raw materials of the region.
2. To help the existing industries of the region and foster new ones.
3. To solve problems peculiar to the region due to its geographic conditions.

STAFF:

Scientists.	48
Engineers.	14
Other Technical Staff.	54
Administrative Staff.	27
Total	143

MAIN DIVISIONS:

1. Biochemistry.
2. Plant Chemistry.
3. Botany.
4. Paper and Cellulose technology.
5. Cement Technology.
6. General Engineering.
7. Chemical Engineering.
8. Earthquake Engineering.
9. Coal Technology.
10. Petroleum Technology.
11. Analytical Chemistry.
12. Physics.

MAIN ACHIEVEMENTS:

1. Processing of high grade pectin from lemon peel, oxalic acid from pineapple fruit waste, and chemical studies of Rauvolfia serpentina, ergot and ipecac etc.
2. Work on paper and forest products, low temperature carbonisation of Assam coals, recovery of sulphur from Assam coals, petroleum, natural gas and medicinal plants has been taken up.
3. Tetraploids have been induced in some medicinal plants and are found to yield increased active principles of medicinal value.
4. Earthquake engineering work - preparation of a map showing belts of tectonic activity and fabrication of devices for measurement of dynamic strains in buildings during quakes.

5. Manufacture of chip boards, hardboards and insulation boards using bamboo, wood, and the binder obtained from tea wastes.
6. Pulping of bamboo at normal pressures without the need for high pressure.
7. Rayon grade pulp from local reeds.
8. Use of Masua ferrea for the production of enamels, varnishes and surface coatings, alkyd resins etc.
9. Low temperature carbonisation.
10. Petrochemicals.
11. Protein from crude petroleum.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory has a potential role to play in the country's development. The regional problems which require attention are those relating to petroleum and natural gas, utilisation of Assam coals through hydrogenation, low temperature carbonisation and desulphurisation cement production from regional raw materials and utilisation of medicinal plants, horticultural and forest products.

27.

NAME OF THE
INSTITUTION

REGIONAL RESEARCH LABORATORY
UPPAL ROAD, HYDERABAD-9.

TAKEN OVER BY CSIR:

1956

NAME OF THE DIRECTOR:

Dr. G.S. Sidhu

AIMS AND FUNCTIONS:

1. Systematic study of the utilisation of raw materials of the region and assist development of industries.
2. Surveys and investigations on raw materials, processes techniques, and industrial products.
3. Fields of research include fuels, vegetable oils, surface coatings, heavy chemicals and fertilizers, ceramics, organic chemicals, drugs and pharmaceuticals chemical engineering and operational research.

STAFF:

Scientists & Technologists.	188
Auxiliary Technical Staff.	269
Administrative Staff.	69
Total.	526

MAIN DIVISIONS:

1. Coal.
2. Oils and fats.
3. Surface coatings and pigments.
4. Heavy chemicals and fertilisers.
5. Ceramics.
6. Industrial organic chemicals and synthetic drugs.
7. Cellulose and handmade paper.
8. Biochemistry.
9. Entomology.
10. Chemical engineering.
11. General engineering.
12. Operational Research, Technical Information and liaison.
13. Organic chemistry, drugs and pharmaceuticals.

MAIN ACHIEVEMENTS:

1. Low-Temperature Carbonisation of non-caking coals.
2. Different grades of active carbons.
3. Cottonseed processing.
4. Industrially useful hydrogenated castor oil and dehydrated castor oil.
5. Organic Fine Chemicals and Pharmaceutical products.
6. Coating compositions from cashewnut shell liquid.
7. Substitute for imported red lead primer

8. Hand-made paper, high bursting strength paper, document paper and filter paper.
9. Production of chemical cotton.
10. Dye and drug intermediates and perfumery chemicals.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory will be of direct assistance to industries of the region. A number of semicommercial experimental plants have been installed to collect process, economic and design data, serve as demonstration units and supply newer products for market acceptability trials.

28. NAME OF THE INSTITUTION REGIONAL RESEARCH LABORATORY,
BHUBANESHWAR, (ORISSA)

YEAR OF ESTABLISHMENT: 1964

NAME OF THE DIRECTOR: Shri G.S. Chowdhury

AIMS AND FUNCTIONS:

1. To undertake the problems of exploiting the resources of the region.

STAFF:

Scientists.	31
Technical.	6
Administrative staff.	7
Total	44

MAIN DIVISIONS:

1. Chemical technology.
2. Fisheries.
3. Minerals.
4. Paper.
5. Coal.
6. Fuels.
7. Engineering and Technical Services.

MAIN ACHIEVEMENTS:

1. Developments of suitable pelletizing and granulating techniques regarding limestone for utilisation as a fluxing agent.
2. Upgrading of the manganese ores by reducing the iron content.
3. Process development for reduction of phosphorus content in manganese ores.
4. Design and fabrication of sinterband furnace.
5. Beneficiation of graphite ores and production of colloidal graphite lubricants for high temperatures.
6. Washing and refining of sandstone for use in glass industry.
7. Hydro-treatment of LT tars from Talcher Coal.
8. Development of pulverized fuel systems on LTC Coke.
9. Removal of silica from effluent liquors in paper plants.
10. Process development for utilisation of bamboo dust and saw dust from chippers in paper plants.
11. Process development and designing of equipment for extraction of fish protein from local fish.
12. Extraction and utilization of fish oil from marine fish with particular reference to industrial use.
13. Design and development of oil diffusion pumps.
14. Design and construction of a freeze drying unit.
15. Integral oil burners.
16. Ferodynamic heat exchanger.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory will be of vital use in the fields of agricultural and animal husbandry wastes, development of leather industry, bamboo and timber based industries, fisheries and fish processing industry mineral beneficiation and upgrading technical aid to government and industrial organisation including small scale and cottage industries.

IV. MINISTRY OF FOOD, AGRICULTURE, COMMUNITY
DEVELOPMENT AND CO-OPERATION.

There are 4 scientific research organisations directly under the Ministry. Further, the Indian Council of Agriculture Research has 30 research institutes under it. A brief description of all these institutions is given in the following pages.

(A) INSTITUTES DIRECTLY UNDER THE MINISTRY:

1. NAME OF THE INSTITUTION NATIONAL SUGAR INSTITUTE,
P.BOX NO. 16, K A N P U R.

YEAR OF ESTABLISHMENT: 1936

NAME OF THE DIRECTOR: Shri S.C. Gupta

AIMS AND FUNCTIONS:

1. To provide training in Sugar Technology, Sugar Engg. and Alcohol Technology.
2. To undertake research on (i) Problems pertaining to Sugar Technology, Sugar and Sugarcane Chemistry and Sugar Engineering in general and (ii) those of Indian sugar factories in particular (iii) Utilisation of by-products of Sugar Industry such as cane trash, bagasse, press mud and final molasses.
3. To give technical advice and assistance to Indian sugar factories, Central and State Govts. and other organisations concerning sugar and allied industries.
4. To provide extension service to sugar industry in regard to the latest developments in technique and machinery design, fuel economy etc.
5. To collect, collate and issue Technical Statistics relating to sugar Industry.
6. To prepare and issue the sugar standards.

STAFF:

Scientists & Technologists.	51
Other Technical Staff.	26
Administrative Staff.	80
Total.	157

MAIN DIVISIONS:

1. Chemical Engineering
2. Physical Chemistry
3. Sugar Chemistry (Agri.) - Sugarcane Farm
4. Organic Chemistry
5. Bio-Chemistry - - (Effluent Scheme
(Bio-Gas
(Bagasse Scheme
6. Sugar Engineering - (Instrument Section
(Sharkara Prayogshala
(Photo and Audio-Visual Section
(Sharkara Prayogshala
7. Sugar Technology - (Education Section
(Gur & Khandsari Section
(Molasses Scheme
(Khandsari Research Scheme
8. Advisory Division - Technology and Engineering
9. Survey and Information - (Technical Section
(Statistical Section
(Publication Section
(Bureau of Sugar Standards
(Development Section
(Beet Project
10. Design and Development Division.
11. Administrative - (Establishment Section
(Accounts Section
(General Record Section
(Store Purchase Section
(Library
(Typing and Despatch Section
(Hindi Cell and Welfare

MAIN ACHIEVEMENTS:

1. Fractional liming of cane juice.
2. Refining of Bulochistan sulphur for use in sugar industry.
3. A new technique of cane juice clarification.
4. Manufacture of Bagomolasses for cattle feeding
5. Manufacture of activated carbon from bagasse.

6. Manufacture of fodder yeast and food yeast.
7. Manufacture of Plastic from molasses.
8. Treatment of sugar factory and distillery effluents.
9. Design of moisture proof sugar godowns.
10. Resistance heating of massecuites.
11. Design of efficient bagasse furnaces.
12. Preharvest maturity survey of sugarcane crops.
13. Design of bullock driven cane crusher.
14. Design of a six roller power crusher for khandsari plant.
15. Development of sulphitation process of khandsari manufacture.
16. Design of wet bagasse furnace for khandsari factory.
17. Evolution of sugar standards for direct consumption white sugar and colour standards for raw sugars.
18. Manufacture of white sugar without sulphur.
19. Automatic juice sampling device for sugar factories.
20. Development of surface active chemical 'INSTOL' for reducing viscosity and improving processing of sugar.
21. Design of mother liquor sampler.
22. Design of continuous liming and sulphitation equipment.
23. Demineralisation of cane juice by ion-exchange process and use of ion-exchange resins for decalcification of clarified juice and decolourisation of syrups.
24. Production of Bio-gas and bio-fertilizer.
25. Extraction and modification of sugarcane wax.
26. Processing sugar beets for manufacturing sugar under Indian conditions.
27. Evolution of suitable methods of testing sugarcane for its quality with a view to linking the payment of cane price with its quality.

RESEARCH FACILITIES AND EQUIPMENTS:

Research is the main activity of the Institute and is being carried out by the staff and students working for the fellowship and Ph.D. Degree. The Institute has got laboratories fitted with latest type of equipment and apparatus and there exist facilities for research of fundamental as well as applied nature.

PUBLICATIONS:

1. Sharkara - Published quarterly in English.
2. N.S.I. News - Published quarterly in English.
3. Annual Report of the Institute - in English.
4. Review of the working of Central Sugar Factories - Annually in English.
5. Review of quality of sugar produced by Indian Sugar Factories - Annually in English.

PLACE IN COUNTRY'S DEVELOPMENT:

The sugar industry is the second largest industry in India and being purely agro-based, the prosperity of millions of cultivators and of large rural tracts depend upon it. The National Sugar Institute is intimately associated with all research and development problems of this important industry and has a unique functional set-up covering its entire technical and scientific needs. The work done at the Institute is of considerable importance and magnitude. The technical education programme provided by the Institute is helping to turn out competent and useful personnel needed in the various technical and chemical fields in the process of sugar manufacture. Also the technical advice and assistance and extension service rendered by the Institute, backed by the skill and ability achieved by its staff by their painstaking research work, has played a significant role in the proper development of the sugar industry in the country and in maintaining its efficiency.

2. NAME OF THE INSTITUTION FOREST RESEARCH INSTITUTE,
DEHRA DUN
YEAR OF ESTABLISHMENT: 1906
NAME OF THE PRESIDENT: Shri T.N. Shrivastava

AIMS AND FUNCTIONS:

1. To solve the forestry problems peculiar to India.
2. To train personnel to man the State Forest Departments.

STAFF:

Administrative.	240
Research.	264
Technical.	372
Total.	876

MAIN DIVISIONS:

1. Silviculture Branch.
2. Logging Branch.
3. Botany Branch.
4. Forest Entomology Branch.
5. Forest Pathology Branch.
6. Wood Anatomy Branch.
7. Wood Seasoning Branch.
8. Wood Preservation Branch.
9. Timber Mechanics Branch.
10. Timber Engineering Branch.
11. Composite wood Branch.
12. Cellulose and Paper Branch.
13. Minor Forest Products Branch.
14. Chemistry of Forest Products Branch.
15. Statistical Branch .
16. Service Branch.

MAIN ACHIEVEMENTS:

1. Trials are underway to introduce a number of fast growing exotics.
2. Special investigations like management of bamboo forests.
3. Time and motion studies in forestry operations.
4. Has contributed much in broadening the horizons of timber harvesting
5. Genetic improvement of useful forest tree species by selective breeding and hybridization, by induced polyploidy and mutations.
6. Introduction and acclimatization of valuable exotic species of forestry value.
7. Methods are developed for the first time to determine and estimate the natural resistance of timbers to termites which are the worst enemy of wood.
8. Control measures have been evolved for several forest pests.

9. Research in forest pathology - mainly on the diseases of trees and decays of timber,
10. Much work has been done on wood destroying fungi and the damage caused by them on wood.
11. Anatomical studies on Indian woods from the point of view of their utilisation.
12. Scientific study of timber seasoning.
13. Designed a number of air-seasoning sheds and seasoning kilns including veneer dryers.
14. Investigations on the air seasoning of various Indian timbers, railway sleepers, poles, bamboos, willow for cricket bats and artificial limbs etc.
15. 3-ply end jute mill bobbins.
16. Battery separators from Indian timbers.
17. A set of tools for making pencils.
18. Cheap as well as effective treating methods for bamboos.
19. Fire - resistive compositions and paints for indoor and outdoor uses.
20. Satisfactory adhesives from various proteins, seed cakes, coconut shells, cashew nut shell liquid, tannins etc.
21. Pulping of mixed hardwoods has been successfully accomplished.
22. Identification of santonin and non-santonin yielding varieties of Indian artemisia, thereby helping to place the santonin industry in India on a sound commercial footing.
23. Cultivation of economic plants like ocimum, sarpagandha, santonin yielding artemisia, citronella grass, podophyllum, belladonna etc.
24. Development of resin and turpentine and essential oil industries.
25. An improved method for katha manufacture has been evolved.

3. NAME OF THE INSTITUTION FOREST RESEARCH CENTRE, COIMBATORE-2

YEAR OF ESTABLISHMENT: 1959

NAME OF THE DIRECTOR: Shri M.B. Peter, I.F.S.,

AIMS AND FUNCTIONS:

1. To organise research work in Forestry effectively on a regional basis.
2. Deals with the biological problems of Forestry Importance especially in relation to forests of the Sourthern Region.
3. Strives for the development of Forest wealth and caters to the special Research problems of the Central and South India.

STAFF:

Scientists and technologists.	11
Ausiliary Technical staff.	10
Administrative staff.	7
Total	28

RESEARCH FACILITIES AND EQUIPMENTS:

(a) Silviculture and Soil Science section:

1. Wagner's shaking machine	1
2. Hellige Chromatron Photoelectric Colorimeter	1
3. Platinum dish with lid.	1
4. Kjeldhal nitrogen determination apparatus	1
5. Hot Air oven	1
6. Muffle furnace - craftsman make	1
7. Bechman p ^H meter. Model H2	1
8. Philips conductivity measuring bridge with cell.	1
9. La-Motte combination Soil testing outfit.	1
10. Water still - Kilburn monesty	1

11. Monocular standard microscope	1
12. Binocular - Japan.	1
13. Knapsack mist sprayer-cum-duster - Plat make (power operated)	1
14. Knapsack sprayer.	1
15. Moisture-in-Timber meter.	1

(b) Entomology section:

1. Electrolux Refrigerator.	1
2. Binocular Dissecting microscope with substage.	1
3. Electric Over 22" x 23" x 29	1
4. Slide cabinet.	1
5. Observation Cages.	6
6. Zinc breeding cages.	5
7. "Heraeus" cylindrical Incubator.	1
8. Camera Lucida - BBT - French.	1
9. Thermohygrograph N & Z.	
10. High vacuum pump - electrically operated.	1
11. Adco paraffin bath.	1
12. 'Jem' Large rotary microtome.	1
13. Moisture in Timber meter.	1
14. Aspee Bolo - Motorised knapsack sprayer- cum-duster - power operate.	1
15. Rocking sprayer.	1
16. Binocular.	1
17. Wild Heerbrugg Research microscope with accessories (ordered and supply expected)	1

(c) Botany section :

1. Clinical microscope.	1
2. Binoculars.	1
3. Pocket Transit - Bruton compass.	1
4. Microtome.	1
5. Meonta dissecting microscope.	1
6. Altimeter.	1

(d) Mycology Section:

1. Gansons Distillation apparatus.	1
2. Allwyn Prescold Refrigerator.	1
3. Clinical microscope.	1
4. Autoclave - Horizontal pattern	1
5. -do- vertical -do-	1
6. Drying and sterilising oven- Rectangular.	1
7. Hot Air steriliser - 'Kob'	1
8. High Precision Incubators.	2
9. Monocular Standard Microscope.	1
10. Stereoscopic Binocular Microscope (B & L)	1
11. Meopta Compound microscope with accessories.	1
12. Wood cutting microtome	1
13. Binocular.	1

PUBLICATIONS:

All the research publications are published in English. The publications are generally made in the "Indian Forestry", Dehra Dun.

PLACE IN COUNTRY'S DEVELOPMENT:

This Research Centre is located in the Southern Forest Rangers College Estate, Coimbatore, under the administrative control of the Head of Biological Research, who is also the Principal of the Southern Forest Rangers College, Coimbatore. It is under the control of the Forest Research Institute and Colleges, Dehra Dun, which has been recognised by the Food and Agriculture Organisation of the United Nations as an International Centre of Forestry Training and Research for the South-East Asia and Pacific Region.

4. NAME OF THE INSTITUTION GRAIN STORAGE RESEARCH & TRAINING CENTRE
HAPUR(U.P.).

NAME OF THE DIRECTOR: Dr. K. Krishna Murthy

AIMS AND FUNCTIONS:

It has a tripal function to carry out the field scale Research, training and Extension programmes to moderanise and disseminate the idea of Scientific Storage, Inspection, Handling and Processing Food grains.

STAFF:

Scientists and Technologists.	3
Auxiliary Technical Staff.	8
Administrative Staff.	6
Total	17

MAIN DIVISIONS:

1. Laboratory and field scale research.
2. Theoritical and practical training.
3. Extension Work.

MAIN ACHIEVEMENTS:

1. It has trained 2483 officials belonging to Central Food Department 543, State 580, F.C.I. 73, Trader/Farmers organisations, Cooperatives and mills etc. 10, foreign trainees have also gone through this Centre. The total No. of trained personnel also includes 34 Pest control operators from various firms in the country.
2. In the field of Extension, Scientific methods of storage, fumigation and rodent control have been demonstrated to the Traders/Farmers in the near by villages.
3. A quarterely publication titled "Bulletin of Grain Technology" is being issued from here under the auspicious of Foodgrain Technologists Research Association of India, Hapur.
4. Similarly, in the field of Research also this centre has made significant contributions by introducing the use of Malathion and Aluminum Phosphide for spraying and fumigation of stored food-grains respectively in the country and these insecticides are found to be very effective and economical too.

5. The use of LDB ampoules in a storage structure known as "Hapur Thekka" also designed by this Centre, has been made popular for proper storage of foodgrains at Farm level.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

PHYSICAL SECTION:

1. Various Devices for drawing and dividing of grain samples.
2. Necessary equipment to record the density/weight volume ration of the food grains.
3. Appliances for separation of foreign matter and defective kernels in the grain samples.
4. Machines for recording the grain temperature and moisture.
5. Laboratory mill for polishing rice.
6. An optical instrument to study the degree of milling of rice by measuring its reflectance.
7. Physical/Precision balances.

B. BIOLOGICAL SECTION:

1. Insect Rearing Room.
2. Incubator.
3. Germinator.
4. Fumatoria for Laboratory Studies with fumigants.
5. Beckman Spectro-photometer.
6. Beckman Gas Chromato-graph.
7. Temperature and Humidity Recording Devices.
8. Micro-scops.
9. Model Storage structures.
10. Gow-mac-gas analyser for measuring the concentration of fumigants.
11. Refrigerator.
12. Vaccum Pump.
13. Pressure Measuring Devices.

C. CHEMICAL SECTION:

1. Microbes-Auto-clave.
2. Macro and Micro Kjeldahl apparatus for nitrogen estimation.
3. Water-bath.
4. Hot plates.
5. Distillation plant.
6. Muffle furnace.
7. Fume-hood.
8. Soxhlet apparatus.
9. Ferinograph to study extensibility of flour.
10. Laboratory Mill for grinding wheat.
11. Many other glass ware/reagents for estimation of pesticide residues and quality of milled products.

PUBLICATIONS:

1. The Bulletin of Grain Technology.
2. Leaf-lets in popular languages for identification of stored insects pest and their control, Rats and their control etc.

PLACE IN COUNTRY'S DEVELOPMENT:

In view of the heavy losses occurring in Storage/handling of foodgrains during post-harvest period, the role being played by this Centre in the country's development on the Food front is indeed very significant.

(B) INDIAN COUNCIL OF AGRICULTURAL RESEARCH

On the recommendations of the Royal Commission on Agriculture, which was appointed in 1928 to enquire into the agricultural set up and rural economy of the country, the Government of India established the Imperial Council of Agricultural Research in 1929 as a registered body under the Registration of Societies Act, 1860. The Organisation of the Council was divided into two parts with executive and advisory functions. The executive part which was known as the 'Governing Body' managed all affairs and funds of the council and the advisory part known as the "Advisory Board", examined all proposals in connection with the scientific objects of the council and advised on any other matters referred to it by the Governing Body. The Secretariat of the Council was declared as a regular Department of the Government of India secretariat and it lasted as such till 1939 when the secretariat work was transferred to the Department of Education, Health and Lands. In 1946, the Council also took over subjects connected with the application of the results of research to field practice.

The Council functioned through a Governing Body and an Advisory Board up to the year 1940, when first a Standing Finance Committee was set up and then were established Scientific Committees and Regional Committees in 1941.

In 1947, the name of the Council was changed to the Indian Council of Agricultural Research. In 1965, the Indian Council of Agricultural Research was reorganised and it took over all the research institutes formerly under the control of the Department of Agriculture and the several commodity committees. Thus all the agricultural research institutions were under the unified control of ICAR. Under the reorganised pattern of ICAR, a broad based Governing Body has been set up on the lines of that of CSIR. There are also set up a number of standing committees, ad hoc committees and panels to examine specific matters concerning the Council.

The main functions of the Council are:-

- (a) To undertake, aid, promote and co-ordinate agricultural and animal husbandry education, research and its application in practice, development of marketing in India, by all means calculated to increase the scientific knowledge of the subjects and to secure its adoption in every day practice; and

- (b) To act as a clearing house of information, not only in regard to research but also in regard to agricultural and veterinary matters generally.

The Council carries out its educational and research functions through 30 research Institutes under it, which are described in the following pages.

1. NAME OF THE INSTITUTION INDIAN AGRICULTURAL RESEARCH INSTITUTE,
NEW DELHI-12

YEAR OF ESTABLISHMENT: 1905 (at Pusa in Bihar
transferred to New
Delhi in 1936)

NAME OF THE DIRECTOR: Dr. M.S. Swaminathan

AIMS AND FUNCTIONS:

1. Fundamental and applied research on basic problems.
2. Post-graduate instruction leading to the M.Sc and Ph.D. degree; the Institute has the status of a university.

STAFF:

Scientists & Technologists.	1291
Auxiliary Technical Staff.	54
Administrative Staff.	421
Total.	1626

MAIN DIVISIONS:

1. Agronomy.
2. Botany.
3. Entomology.
4. Agricultural Economics.
5. Agricultural Engineering.
6. Agricultural Extension.
7. Agricultural Physics.
8. Microbiology.
9. Mycology and Plant Pathology.

10. Plant Introduction. 11. Horticulture.
12. Soil Science and Agricultural Chemistry.
13. All India Soil and Land Use Survey.

MAIN SUB-STATIONS:

- (a) Agricultural Research Station Karnal.
- (b) Botanical Sub-Station, Pusa, Bihar.
- (c) Central Vegetable Breeding sub-station at Katrain, Kulu valley.

MAIN ACHIEVEMENTS:

1. Bullock - drawn cultivator-cum-speed drill.
2. Two row groundnut planter.
3. Bio-gas operated engine.
4. Water measuring and allied devices for efficient irrigation.
5. Single bullock harners.
6. Plant breeding and genetics: Wheat N.P. 860 and N.P. 880 gave the best performance under irrigated conditions in the Northern plains in the All India uniform Regional Trials while N.P. 838 were superior to existing varieties under barani conditions on rich soil with irrigation and for the late sown crop, respectively
7. Studies on the Q locus in bread wheats.
8. Chemical mutagenesis in barley.
9. Biochemical effects of x-rays.
10. Mutation breeding in oilseeds.
11. Inter-specific hybridization.
12. Studies on indirect effects of irradiation.
13. Studies on the effect of water stress.
14. Role of photosynthesis in grain development in wheat.
15. Micronutrition studies.
16. Studies on the control schedules for cotton and maize crops, bioassay of acaricides, against mites and their predator.
17. Work on the fundamentals of insect toxicology.

18. Studies on insect parasitology.
19. Studies on insect physiology.
20. Three species of plant parasitic nematodes were recorded from India for the first time on maize and sorghum.
21. Entomological investigations with the help of radio active isotopes.
22. Three hundred and seven seed samples received from different states were examined for insect damage.
23. Available micro-nutrient status of Indian Soils.
24. Effect of zinc on wheat.
25. Biochemical role of micro-nutrients.
26. Available sulphur status in Indian Soils.
27. Physiochemical investigations on rice soils.
28. Measurement of P^{32} in plant material by autoradiographic technique.
29. Procedure for estimation of potassium.
30. Potassium supplying power of different Indian Soils.
31. Leaf drying disease of paddy in Sahabad, Bihar.
32. Iso-conductivity value of clays.
33. Electrophysiological techniques for study of nerve potentials.
34. Estimation of micro-elements in soils and plants is being carried out so far using either cathoda layer or other direct current techniques.
35. Fundamental study on genesis and classification of the soils of the country.

2. NAME OF THE INSTITUTION NATIONAL DAIRY RESEARCH INSTITUTE
KARNAL(PUNJAB).

YEAR OF ESTABLISHMENT: 1956

NAME OF THE DIRECTOR: Dr. S.N. Ray

AIMS AND FUNCTIONS:

1. To conduct Research, both fundamental and applied in the spheres of Dairy Husbandry, Dairy Technology, Dairy Chemistry, Dairy Bacteriology, Dairy Engineering, Dairy Extension, Dairy Nutrition and Dietetics, and Dairy Economics and Statistics for the development of dairying in India.
2. To impart training at the under-graduates and post-graduate levels, and to arrange other short courses/specialization courses in particular subjects to meet the requirements of the industry in India.
3. To make available the results of research conducted at this Institute, as well as other proven and established scientific dairy practices through extension services.

The National Dairy Research Institute functions through three Regional Stations located at Bangalore, Bombay and Kalyani, which deal with the regional problems of the country. The Bangalore Station happens to be the oldest centre of the dairy training in India.

STAFF:

Scientists and Technologists.	218
Auxiliary Technical Staff.	243
Administrative Staff.	142
Total	603

MAIN DIVISIONS:

1. Dairy Husbandry.
2. Dairy Technology.
3. Dairy Chemistry.
4. Dairy Microbiology.
5. Dairy Engineering.
6. Dairy Extension.
7. Dairy Economics and Statistics.
8. Dairy Nutrition and Dietetics.

There is also a division of Dairy Education and Training under whose administration there is a Dairy Science College where under-graduate, post-graduate and diploma courses are conducted.

MAIN ACHIEVEMENTS:

1. Introduction of high yielding varieties of nutritive forage crops.
2. Studies on the rumen metabolism of cows and buffaloes.
3. Studies on cross-breeding of cattle with Exotic breeds to develop high producing cattle.
4. Protein requirements of calves for growth.
5. Production of anti-serum to differentiate between cow and buffalo milk (Hansa Test).
6. Studies on the manufacture of ice-cream.
7. Preparation of cheese, condensed and evaporated milk from buffalo milk.
8. Standardization of an accelerated oxidation test to determine the shelf-life of ghee, produced packed and stored under variable condition.
9. Studies on methylene blue reduction test in cow and buffalo milk.
10. Studies on rennet-like milk coagulating enzymes from vegetable and bacterial sources.
11. Bacteriological survey of ice-cream.
12. Studies on germicidal action of cow and buffalo milk.
13. Studies on pasteurisation of milk in relation to destruction of pathogenic bacteria and improvement of keeping quality.
14. Studies on the preparation of dairy sanitizers.
15. Production of nisin-antibacterial substance produced by the micro-organisms S. Lactis
16. Studies on proteins, N.P.N. and phospholipids components of cow and buffalo milk.
17. Studies on the sulphhydryl contents of cow and buffalo milk.
18. Development of a plant for continuous manufacture of Khoa.
19. A batch method of manufacture of dahi.
20. Development of bottle and can sterilizer.
21. Development of Rural Milk Chilling Unit.
22. Development of Bicycle can carrier and Electric Farm Fencing Unit.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Institute's laboratories are adequately equipped for teaching as well as research programme. The Institute has a farm of 1400 acres which produces sufficient fodder for a herd of 1200 high pedigreed indigenous and cross-bred cattle. The Experimental Dairy has all modern equipments required in milk processing and dairy manufactures. Practically with each laboratory are associated schemes and projects sponsored by the I.C.A.R. or P.L. 480 research programmes.

PUBLICATIONS:

- a) Annual Report - English (copy enclosed)
- b) Extension Literature - English & Hindi (set enclosed)
- c) Dairy Extension Journal -English (copy enclosed)

PLACE IN COUNTRY'S DEVELOPMENT:

The N.D.R.I. is the only Institute of its kind in the country having an important bearing on the development of dairying in India. It is one of the key institutions under the I.C.A.R. and will soon acquire the status of a national Institute. Most of the scientific personnel now employed in the different sections of the dairy industry within this country are a product of the Institute. Association with Colombo Plan adds to its importance and scholars from middle east and south-east Asian countries are deputed to this Institute for higher education and research in dairying.

3. NAME OF THE INSTITUTE INDIAN VETERINARY RESEARCH INSTITUTE,
IZATNAGAR, U.P.

YEAR OF ESTABLISHMENT: 1914

YEAR OF RENAMING: 1947

NAME OF THE DIRECTOR: Dr. C.M. Singh

AIMS AND FUNCTIONS:

1. Envisages improvement of the large livestock population of our country by better breeding, better feeding disease control and better management on scientific lines.
2. Conducts research on diseases nutrition, breeding poultry and cognate matters.

3. Acts as clearing houses for providing necessary advice in solving problems relating to livestock diseases and animal husbandry problems of the Country.
4. Fundamental research in regard to various contagious diseases and pests in India.
5. Fundamental research in Animal nutrition, Animal Genetics, and Artificial insemination.
6. The production of biological products for the prevention and cure of animal diseases.
7. Post-graduate training of students in the various subjects of animal husbandry.

<u>STAFF:</u> Scientists & Technologists.	150
Auxiliary Technical Staff.	402
Ministerial staff.	605
Total	1157

MAIN DIVISIONS:

1. Animal Nutrition.
2. Animal Genetics.
3. Pathology.
4. Parasitology.
5. Biological Products.
6. Poultry Research.
7. Physiology.
8. Bacteriology and Virology.
9. Post Graduate College of Animal Sciences.

MAIN ACHIEVEMENTS:

1. Goat - tissue vaccine, lapinised and lapinised-avianised vaccine.
2. Control of South African Horse Sickness in Jaipur.
3. Haemorrhagic Septicaemia.
4. A vaccine against Swine fever.
5. A reliable sensitive diagnostic agent for detecting Johne's disease.
6. Research on parasites.

7. Cheap protein sources by the use of mango seed kernels, jaman seeds, tamarind seeds etc.
8. The technique of artificial insemination with a good dilutor of semen has provided a means of overcoming the problem of paucity of quality bulls.
9. Successful results have been obtained to augment the fertility in farm animals by the use of pregnant mare serum and in industry lactation in sterile cows and immature females by implantation of stilboestrol tablets.
10. The original Desi bird which lays 50 small eggs in a year after evolving over ten generations produced an average of 150 large-sized eggs.
11. Experiments have revealed that ducks can be reared without making elaborate arrangements for water.
12. Evolution of a standardised method for determining the digestibility coefficient of proteins in poultry rations. A non-cereal ration was also formulated and it has given good results.
13. Egg spoilage during the summer months can be prevented by heat treating the eggs in water at 54.5°C for fifteen minutes and further improvement can be effected by lime-sealing the heat-treated eggs.
14. Vaccine against Ranikhet disease which gives life-long immunity.
15. An efficacious vaccine against fowl pox.
16. Tick fever vaccine.
17. A new antigen highly specific and efficacious to detect the birds suffering from fowl typhoid.
18. The following diseases were recorded for the first time in India -
 - (a) fowl malaria in 1952.
 - (b) Duck virus hepatitis in 1958.
 - (c) Psittacosis/ornithosis in 1963.
 - (d) Chronic respiratory disease in 1962.
 - (e) Avian Encephalomyelitis in 1964.
 - (f) Infections Laryngo Tracheitis.
19. As many as 42 biological products for the diagnosis and control of animal diseases are being manufactured.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute is engaged in problems which have not yet been solved and in evolving plans to eradicate some of the new disease recently encountered in our country. Besides research and advisory work, post-graduate training is also imparted to the veterinary graduates and others to meet the shortage of suitably qualified technical personnel in the field of veterinary science and animal husbandry. The Indian Veterinary Research Institute is the only Central Institute of its kind in the country and is doing an important job in the solution of the various problems facing the country in the development of its livestock.

4. NAME OF THE INSTITUTION CENTRAL POTATO RESEARCH INSTITUTE
SIMLA

YEAR OF ESTABLISHMENT: 1949

NAME OF THE DIRECTOR: Dr. Pushkarnath,

AIMS AND FUNCTIONS:

1. Breeding and selection of high-yielding and disease-resistant varieties suited to different agro-climatic conditions in the country.
2. Determination of optimum standards of cultivation in relation to soil-climate complex and investigation of problems connected with storage.
3. Survey and investigation of major diseases and pests of potato (in the field and in the storage) with a view to devise control measures.
4. Building up disease-free nucleus foundation stocks of different varieties for multiplication under seed certification organisations in the States.
5. Training of personnel engaged in the crop on different aspects of potato production.
6. Organisation of potato workshops and farmers ~~meets~~ ^{melas} for the dissemination of the results of research.

STAFF:

Scientists.	80
Technologists.	2
Auxiliary Technical staff.	23
Administrative Staff.	57
Total	162

MAIN DIVISIONS:

1. Breeding, Genetics & Cytogenetics.
2. Seed Development and Production.
3. Agronomy.
4. Agricultural Chemistry.
5. Biochemistry.
6. Plant Physiology.
7. Nematology and Entomology.
8. Plant Pathology.
9. Virus Pathology.
10. Agricultural Engineering.
11. Statistics.

MAIN ACHIEVEMENTS:

- (a) A number of high-yielding and disease-resistant varieties have been evolved, selected and recommended for commercial culture in different regions of the country. The varieties so far released by the Institute are Kufri Kuber, Kufri Red, Kufri Safed, Kufri Kundan, Kufri Kisan, Kufri Kumar, Kufri Neela, Kufri Chandramukhi and Kufri Sindhri.
- (b) Certain late-blight resistant varieties evolved recently by the Institute are under extensive trials and will be released for culture in the near future. The most promising of these are SLB/E-402, SLB/Z-389b, SLB/Z391b and A. 3649.
- (c) The Institute has developed a series of frost-resistant varieties as well. Among these C-3745 is awaiting release.
- (d) The Institute has developed a number of new techniques in breeding and is conducting advanced research on these. The most profitable lines among these are production of apomicts and exploitation of polyhaploids.
- (e) In addition, rapid but effective techniques for use in screening for resistance to diseases and pests have also been developed (such as cut leaf rooting technique for screening resistance against root-knot nematode and detached leaf technique for testing early blight resistance).

- (a) New virus diseases: Besides viruses X,Y,A, Aucuba mosaic and leaf roll, four new ones - S,M, Witch's broom and Alfalfa mosaic - have been found and are being studied.
- (b) Therapeutic treatments:
 - (i) Inhibition of viruses by chemicals: Out of 14 chemicals tried Alpha Naphthyl Acetic Acid and 2- Thiouracil have been found to inhibit the viruses X and Y to a great extent.
 - (ii) Heat inactivation: Hot air: By hot air leaf-roll virus was inactivated in tubers at a constant temperature of 35°C for eight weeks or more. The virus was also inactivated in whole tubers and eye pieces maintained alternatively at high (40°C-42°C) and low (15°C-20°C) temperatures. When the tubers or eye pieces were exposed to high temperatures daily for 2-4 hours, a total duration of 8 to 6 weeks respectively was necessary for complete inactivation.
 - (iii) Hot Water: Considerable inactivation of leaf roll virus was obtained when the whole tubers of different varieties were treated for 17 minutes at 55°C. Cut tubers treated for 25 minutes at 53°C showed a good number of plants free from the virus.
- (c) Nutritional studies: Effect of nutrition on plant growth and concentration of potato viruses X and Y was determined and was observed that concentration of both viruses was maximum at 630p.p.m. nitrogen, 237 p.p.m. phosphorus and 430 p.p.m. of potassium. Maximum growth of plants was also recorded at these levels of nutrition indicating thereby that the virus concentration was correlated with the plant growth.
- (d) New hosts
Ipomea purpurea Lam., Amaranthus blitum, A. edulis Aleuocarpus, Chenopodium ambrosioides, C. canitatum, C. ficifolium, C. foetidum, C. foliosum, C. murale, C. muttala, C. opulifolium and C. quinoa were found to be new local lesion hosts of virus X.
Chenopodium ficifolium, C. murale, C. mittala, C. opulifolium and C. quinoa were found to be new hosts of virus Y.

(e) Aphid transmission studies:

Hereditary variation in the ability of M. persicae to transmit potato viruses Y and leaf roll was observed. Certain clones of M. persicae were found to be more efficient in the transmission of viruses than others. It was also observed that one colony which was efficient in transmitting one virus may not be necessarily efficient in the transmission of another virus.

(f) Production of disease-free stocks of as many as 60 commercial varieties and hybrids have been prepared. However, about 30 important varieties and hybrids received from all over the country are being annually indexed serologically, histologically and biochemically for different viruses in Simla glass-houses, and plants are regularly checked at Fagu for the maintenance of high health standards.

(g) Production of antisera:

Production of antisera against viruses X and S has been standardized and the work has been taken up on a large scale. Besides viruses X and S, antiserum against virus Y has also been produced.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

Almost all the research facilities and equipment necessary for the conduct of day-to-day research are available at the Institute. Wherever necessary, additional facilities are also provided to research workers.

PUBLICATIONS:

Previously the results of research carried out at the Institute were disseminated through the Indian Potato Journal published by the Indian Council of Agricultural Research. With the closure of this Journal now the papers on different aspects of potato culture are published in such Journals as the Indian Journal of Agricultural Science, Indian Farming and other Indian and foreign periodicals. Side by side the Institute has its own ad hoc technical and popular publications. Those published so far are:

ENGLISH

1. Potato in India - Varieties.
2. Annual Scientific Reports of the C.P.R.I.
3. C.P.R.I. - Organisation, Functions and Achievements.

4. Proceedings of the Second All-India Potato Workers' Conference.
5. Potato Cultivation in India.
6. Potato Varieties.
7. Growing Potato - The Right Way I.
8. Report of Dr. Pushkarnath, Director, C.P.R.I. on his study tour to Central and Latin American Countries and the U.S.A.
9. Report of Dr. Pushkarnath on his visit to the Netherlands to attend the International Symposium on the Production and Certification of seed Potatoes.
10. Potato Cultivation in Mysore - Problems and Prospects.
11. Potato Cultivation in Kashmir - Problems and Prospects.
12. Potato Cultivation in Ceylon - Problems and Prospects.
13. Seed Plot Technique - a new approach for seed potato production in plains of India.

HINDI:

14. Bhartiya Krishi Mein Alu.
15. Bharat Ke Maidanon Mein Alu Beej Ka Utpadan.
16. Alu Ki Kismen.
17. Bihar Mein Alu Ki Kheti.

PLACE IN COUNTRY'S DEVELOPMENT:

Central Potato Research Institute is engaged in the development of a scientific potato technology with a view to recommending practical measures for increasing potato production in the country. It has evolved high-yielding and disease-resistant varieties suited to different agro-climatic conditions and standardized cultural practices. The Seed Plot Technique for producing healthy seed during low aphid period in the plains evolved at the Institute has opened up new avenues for production of healthy seed not only for internal requirements but also for export. These achievements hold out a promise for stepping up potato production four-fold (by increasing the area and yield per acre twice) by 1970-71. Since potato has a high yield potential in a wide range of altitudes, season and soil, the increase in its production will go a long way in supplementing our limited food resources and reducing our dependence on cereals.

5. NAME OF THE INSTITUTION CENTRAL RICE RESEARCH INSTITUTE,
CUTTACK, ORISSA.

YEAR OF ESTABLISHMENT: 1946

NAME OF THE DIRECTOR: Dr. S.Y. Padnanabhan

AIMS AND FUNCTIONS:

1. Carry out research on basic and applied aspects in all disciplines of rice culture in order to devise ways and means of increasing hectare yields.
2. Serve as a centre of authoritative information on matters concerning rice production, protection and conservation, and carry out adaptive research on a co-ordinated basis.
3. Train research and extension workers.

STAFF:

Scientists and Technologists.	117
Auxiliary Technical staff.	159
Administrative staff.	64
Total	340

MAIN DIVISIONS:

1. Botany - Plant Breeding, genetics and cytogenetics.
2. Rice technology.
3. Plant Physiology.
4. Agronomy.
5. Agricultural chemistry.
6. Blue Green Algae.
7. Plant Pathology.
8. Entomology.
9. Agricultural Engineering.
10. Statistics,
11. Farm and Estate management.
12. Extension and Training.
13. Saline Rice Research Station.
14. All India Coordinated Rice Improvement Project.

MAIN ACHIEVEMENTS:

1. Methods regarding the use of manure and fertilizer, so that best yield could be had by the application of cheapest manure and fertilizer.
2. Spraying for the protection of crop and also for the high yield.
3. Hybridization programmes.
5. Breeding projects.
6. Comparative study of the different species of the genus for finding out the process of evolution in the genus.
7. Findings regarding the linkage relationship of the genes.
8. Studies regarding rice varieties of different durations for finding out the relationship between duration and photo-sensitivity and interaction of photoperiod with temperature.
9. New and better ways of harvesting.
10. Radio-tracer studies.
11. National Demonstrations.
12. Studies regarding variable efficiency of urea.
13. Effective ways of Soil amendment.
14. Different ways and techniques of cropping.
15. Economic spray schedules.
16. Determination of weather factors regarding the blast fungus.
17. Isolation of an antibiotic effective in controlling blast disease.
18. Screening sets.
19. Methods of artificial infection.
20. Techniques of effective spray.
21. Use of disc harrow or comb harrow.
22. Power filter.
23. National training course for rice breeders and technicians.

6. NAME OF THE INSTITUTION CENTRAL ARID ZONE RESEARCH INSTITUTE,
JODHPUR

I.C.A.R. CONTROL OVER THE INSTITUTE: 1959

NAME OF THE DIRECTOR: Dr. G.C. Taneja

AIMS AND FUNCTIONS:

1. Carries out reconnaissance, micro geomorphic, geo-phdrological, soil and ecological survey in the desert areas of Rajasthan.
2. Conducts socio-economic survey in these areas.

STAFF:

Scientific & Technical.	48
Auxiliary Technical.	137
Administrative Staff.	45
Total.	230

MAIN DIVISIONS:

1. Basic Resources Studies Division.
(Climatology, Hydrology, Geomorphology, Soil Science, Ecology, Plant Physiology and Cartography).
2. Resource Utilization Studies Division.
(Agronomy, Agrostology, Silviculture and Range Management).
3. Human Factory Studies Division.
(Sociology).
4. Special Animal Studies Division.
(Physiological genetics, Animal Ecology and Animal Physiology).

MAIN ACHIEVEMENTS:

The Institute has made successful experiments on crops growing in desert regions so as to get higher yields from them. It has also completed research on vegetation and afforestation of various types of lands in the desert regions. The Institute has also been able to find out the various conditions necessary for breeding sheep in the desert regions.

PUBLICATIONS:

	Research & Technical papers.	Research Notes
Director's Office.	18	x
Basic Resources Studies Division.	41	13
Resource Utilization Studies Division.	40	9
Human Factor Studies Division.	16	4
Special Animal Studies Division.	17	6

LABORATORY EQUIPMENT:

Under the UNESCO Major Project for Arid Zone research equipment valued at \$ 8,561.89 was received and installed in the various laboratories. The major portion of the equipment from UNESCO was for geo-hydrological investigations. The value of the equipment purchased from local resources was Rs. 19,935.00. These comprised of chemicals glassware and scientific apparatus.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has a vital role to play in the development of arid zone. Among the development activities are the seed production and distribution programme, stabilisation of sand dunes, farm forestry and fruit plant nursery.

7. NAME OF THE TUBER CROPS RESEARCH INSTITUTE,
INSTITUTION TRIVANDRUM (Kerala)

YEAR OF ESTABLISHMENT: 1963

NAME OF THE DIRECTOR: Dr. M.L. Magoon

AIMS AND FUNCTIONS:

To evolve and formulate practical measures for increasing production of tuber crops by

- (i) Breeding high-yielding, better-quality, disease and pest-resistant varieties,
- (ii) Determination of best standards of culture, manuring and storage.

- (1.ii) Survey investigation and control of major diseases and pests which take a heavy toll of the crops in the field and of tubers in storage;
- (1.v) Production, maintenance, multiplication and distribution of diseased free, pure seed of improved varieties; and
- (1.vi) Conducting fundamental research on the botany and cytogenetics of the various tuber crops as also on certain agronomical, chemical, physiological, entomological, mycological and pathological aspects of these crops.

STAFF:

Scientists	23
Field staff.	26
Administrative staff.	20
Total	69

MAIN DIVISIONS:

1. Genetics.
2. Crops and Soils.
3. Crop Physiology.
4. Plant Pathology.
5. Entomology.

MAIN ACHIEVEMENTS:

1. Genetic variability is the essence of any crop improvement programme. As a result of vigorous efforts, a germ plasma bank consisting of large collection of genetic stocks in the different tuber crops have been built up at this Institute. These include collections from both indigenous and exotic sources.
2. Detailed morphological studies in about 960 alleged types in Cassava were made and so far 100 distinct morphotypes or cultivars have been identified. Suitable techniques were also developed for palynological, cytomorphological and embryological studies with a view to aid botanical classification of the various cultivars and/or varieties in Cassava.

3. As a result of extensive screening of the germ plasm collections in Casava and intensified breeding programmes carried out during the last four years, several good combiners were isolated. With the help of these high yielding and desirable combiners, hybrids have been developed which are capable of yielding 20 tons or more per acre under proper care. Several other promising Cassava hybrids and selections are under process of rigorous statistical and quality testing before releasing for large scale cultivation.
4. Similarly, as a result of intensive breeding and selection in sweet potato several promising selections and hybrids have been developed capable of yielding over 10 tons per acre.
5. An interspecific cross between cassava and Ceara Rubber has been successfully made with a view to introduce some of the desirable characteristics such as drought resistance, resistance to 'cassava Mosaic' etc. of the latter parent into the former parent and back cross work with Cassava parent is in progress.
6. The mechanism of pollen abortion in male sterile lines of Cassava has been determined and it is found that in some male sterile lines, degeneration of individual microspores is due to the failure of the separation of microspores from the tetrad which leads to the formation of empty anthers. However, in some lines, the pollen abortion has been attributed to the persistent nature, abnormal behaviour and development of tapetum.
7. The Section of Crops and Soils:
The Section has been able to standardise suitable cultural methods viz. optimum plant spacing (i.e. 90 cm x 60 cm for non-branching and 90 cm x 75 cm in branching types); suitable method (i.e. flat method) and system of planting (i.e. 2 plants/hill) and optimum size of seed piece (i.e. 1kg/each) for economical yield in sweet yam. Inter-cropping practices with short duration crops like cowpea, groundnut, green gram and black gram in between Cassava rows have been grown successfully with added advantage.
8. Optimum dose of N.P.K. fertilizers (100:75:100) for certain high yielding hybrids of casava yielded upto 50 tonnes per hectare as compared to the average yield of about 12.5 tonnes/ha in local

varieties. The suitable time of nitrogen application (i.e. split application); suitable form of nitrogenous (i.e. ammophos) and phosphatic (i.e. Basic slag) fertilizers have also been determined. In Sweet yam, and colocasia, the optimum requirement of N.P.K. fertilizers with organic manure has also been worked out.

9. The analyses of representative soil samples collected from the dry and wet land areas of the C.T.C.R.I. Farm and 10 different locations of Kerala indicate that the majority of them are high in acidity; low in organic carbon, nitrogen and phosphorus; A suitable technique for the correction of soil acidity by increasing P^H with application of required quantity of Calcium has been evolved.
10. Studies on cyanogenic glucoside in cassava: Tubers of a large number of cassava strains were classified into very bitter, bitter, non-bitter and sweet categories on the basis of organoleptic test. The results indicate that the cyanoglucoside may not be the only responsible factor for the bitterness of tubers.
11. Influence of nutrition on the HCN content in cassava: The HCN content varies considerably within the same variety. Tubers obtained from different locations of the variety M4 showed variation from 30 mg/kg to 70 mg/kg of HCN in the edible portion. Nitrogen application enhanced the cyanide content. In an experiment on the influence of different sources of nitrogec, on the HCN content in leves, urea produced the lowest quantity while nitrate produced the maximum quantity of this compound.
12. Correlation studies in cassava: Studies on the total leaf area in relation to the final yield of tubers have been conducted in cassava. Results showed a high degree of correlation between these characters when leaf area was recorded during the relatively dry months of December and February. Ability to withstand drought may be an important factor in the contribution to yield. On the basis of this study attempts to select high yielding varieties will be made.

13. Photoperiodic effects on cassava: Photoperiodic studies have revealed that the tuber development in cassava is promoted by 12 and 16 hrs. of light duration given for 5 cycles in the initial stages of growth.

14. The cassava germ plasm collection has been classified into the following 4 categories with regard to mosaic resistance.

- (i) Resistant
- (ii) Moderately resistant
- (iii) Susceptible
- (iv) Highly susceptible.

A simple and satisfactory method to control the spread of cassava mosaic has been also worked out.

15. A Sclerotium sp. isolated from rotten tubers of Amorphophallus was shown to cause tuber rots of various tuber crops such as cassava, amorphophallus, Sweet potato and Colocasia etc. The organism grew well on Oats agar; among the carbohydrate and nitrogen sources tried, the organism grew best on starch and potassium nitrate respectively. Studies in the physiology of growth, sporulation and spore germination of this organism are under progress.

16. Trials with 5 fungicides to control Cercospora leaf spot disease of cassava showed that Coppesan significantly reduced the percentage of infection as well as the number of spots per leaf.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Institute at present possesses a farm of about 52 acres. The laboratories are at present located in rented buildings in the city, since the Institute buildings are yet to be constructed. All efforts are being made to adequately equip the various laboratories with essential research equipments etc. Some of the important equipments have already been obtained and others are still in the process of being procured.

PUBLICATIONS:

As a result of research on various aspects of tuber crops, several publications from the Institute have been published/sent for printing in English language in many well known Indian and foreign Journals.

PLACE IN COUNTRY'S DEVELOPMENT:

The various tuber crops occupy a strategic position in the agricultural economy of our country. Amongst the tuber crops, tapioca and sweet potato cover almost an area of 10 lakh acres which is equal to the area under potato in the country. Several other tuber crops, which are also of great economic importance are also grown in varying acreages in various parts of the country. In spite of the significant role that these crops play as an article of cheap nutritive food for human consumption, very little effort has earlier been made to improve the quality and production of the various tuber crops. It is only recently that the Central Tuber Crops Research Institute has been established at Trivandrum in Kerala. In the present context of rapid increase of population and consequent acute shortage of food grains in India, improvement and increased production of the different tuber crops as food supplementing the cereals are, therefore, considered highly essential.

The different tuber crops have a pride of place in the agricultural economy of the country also because these crops have several unique advantages such as their potential for supplying extremely large quantities of utilizable calories per unit of land area; ability to give economic yields even in marginal utility lands; capacity to withstand erratic climatic conditions admirably; possibilities of cultivation on lands of irregular topography; large freedom from serious pests and diseases; low labour requirements; low cost of production; wide flexibility in planting and harvesting, etc.

Considering all these and other factors, the prospects and potential for expanded production and utilization of these multipurpose crops in our country are indeed very great.

8. NAME OF THE INSTITUTION INDIAN GRASSLAND AND FODDER RESEARCH INSTITUTE, JHANSI (U.P.).

YEAR OF ESTABLISHMENT: 1962

NAME OF THE DIRECTOR: Dr. Mukhtar Singh

AIMS AND FUNCTIONS:

1. To carry out research both of fundamental and applied nature on grasses, grasslands and fodder crops, as related to animal nutrition, soil fertility, crop production and soil and water conservation.

2. To collect, co-ordinate and collate research work on the subject in the country by centralizing direction, operation and superintendence.
3. To find out solutions to the various confronting problems which can be given practical application under the existing social and economic conditions
4. To disseminate knowledge of the subject through organized training courses. . . .

STAFF:

Scientists	17
Technologists.	1
Auxiliary Technical Staff.	11
Administrative Staff.	36
Total	65

MAIN DIVISIONS:

1. Grassland Management.
2. Soil Science and Agronomy.
3. Plant Improvement.
4. Plant/Animal Relationship.
5. Weed Ecology and Control.

MAIN ACHIEVEMENTS:

1. Construction of approach road is in progress. The construction of farm buildings estimated to cost Rs. 2,34,890,00 is nearing completion.
2. A large collection of indigenous and exotic forage material is being built up for maintenance, study and evaluation. The collection comprises 1965 Pennisetum sp., 540 Sorghums, 32 maize varieties, 26 oat varieties and 313 miscellaneous grasses, in addition to 391 legumes.
3. ~~Carrying experiments of~~ using moderate doses of nitrogen and phosphate for increasing the production of grassland.
4. Successful control of unwanted pernicious woody weeds in natural grassland, through use of 2,4,5-T as stump or spray treatment.
5. Introduction of two legumes Phaseolus atropurpureus and Atylosia scarabaeoides in grassland.

6. Technique of making hay on wooden frames.
7. Sprary fertilization with phosphate in berseem for seed production.
8. Proper combination of annual and perennial fodders in mixed-cropping system for year-round fodder production

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Institute has a large farm covering an area of 1421 acres of which about 250 acres is irrigable. The major part of the farm is under grassland. The farm is provided with seasonal irrigation facilities from canal. The farm has two tractors, tractor implements, three pairs of bullocks and 49 experimental lamb. The farm has also other field equipment for cultural operations. A small laboratory for routine chemical analyses with facilities of gas and water has been set up in the rented building, pending the construction of the laboratories at the farm. The Institute has a small growing library with 532 books, 229 pamphlets. The Institute is subscribing to 58 foreign Journals and 22 Indian Journals.

PUBLICATIONS:

The Institute is in initial stages of development. A number of articles are under preparation for publications.

PLACE IN COUNTRY'S DEVELOPMENT:

Recognizing the role of mixed farming in agriculture in India, considerable emphasis is now being placed on livestock development. Intensive Cattle Development Schemes are in operation in the States in selected blocks for improvement through animal breeding, progeny testing and up-grading. As improved animals need better feeding, fodder development in these blocks assumes special significance.

Importance of fodders in milk procurement areas also cannot be minimised. Introduction of forage crops in the cultivator practices, however, depends on the solution of the complex problems associated with these crops. The Institute has, therefore, an important role to play by providing solutions to various problems of fodder production and utilisation.

The investigation at the Institute will lead to the selection of new and better fodders, evolution of improved varieties, and development of management techniques in relation to production and utilization of forage crops. The application of result of research to be carried out at the Institute will help in systematic development of fodder resources of the country and will, thus, lead to livestock development on a sound and economic footing.

9. NAME OF THE INSTITUTION CENTRAL SHEEP AND WOOL RESEARCH INSTITUTE
MALPURA (RAJASTHAN)

YEAR OF ESTABLISHMENT: 1962
NAME OF THE DIRECTOR: Dr. O.P. Singh

AIMS AND FUNCTIONS:

1. To achieve improved productivity of sheep in the country through research into the problems of sheep and wool production.
2. To achieve effective utilisation of different types of wools produced in the country through research into the problems of wool utilisation.
3. Training of Research Workers at various levels including M.Sc., and Ph.D. degrees for handling intricate research problems to facilitate maximum production and utilisation of sheep and wool industry.
4. To carry out research projects touching the various aspects of sheep and wool production and wool utilisation in order to facilitate rapid and effective improvement of the industry as a whole.
5. To evolve superior breeds of sheep suitable for different agro climatic regions of the country and for producing higher quantities of meat and wool.
6. Attempts at successful acclimatisation of superior foreign breeds is another important activity so as to provide a continuous source of superior stud stock of such foreign breeds.
7. Evolution of suitable types of grasses and forages useful for sheep, through intensive research.
8. Establishment of pastures.
9. Designing and applications of modern techniques in different branches.
10. Studies into the habits and physiological requirements of different types of wool fibres produced at the Institute and its substations available in the country for their quality and processing potentialities for finished fabrics.

STAFF:

Scientific.	49
Technical Staff.	23
Administrative Staff.	43
Total	115

MAIN DIVISIONS:

1. Sheep Husbandry.
2. Sheep Genetics.
3. Grassland and Forage Agronomy.
4. Sheep Veterinary.
5. Sheep Nutrition.
6. Sheep Physiology.
7. Fibre Science.
8. Fibre processing.

All these divisions are in the process of organisation.

MAIN ACHIEVEMENTS:

1. Establishment of the main Institute at Malpura(Raj.) and two substations at Garsa (H.P.) and Mannavanur (Madras State).
2. Layout of the Institute farm at Malpura.
3. Partial reclamation of about 1500 acres out of about 4000 acres.
4. Construction of Laboratory Building and 45 residential quarters.
5. Construction of Wool Processing Plant Building.
6. Installation of Wool Processing Plant and partial organisation of laboratories.
7. Constitution of flocks of sheep (1) Rambouillet (2) Malpura (3) Cross breeding operations in progress.
8. Gaddi flock at Garsa Substation and cross breeding operation with Rambouillet Rams.
9. Corriedale flock at Mannavanur Substation and cross breeding programme in operation with local Coimbatore flock.

10. Renovation of existing wells and construction of two Tube wells and two open wells and installation of pump sets on some of the wells.
11. Electrical installation in progress for wool processing plant and laboratories.
12. Research Projects numbering 22 in operation.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

Main research facilities are not under organisation continuously and some of the equipments are procured and other equipments are being provided in the various laboratories now.

PUBLICATIONS:

No. of papers published - 20

All the publications are made in English.

PLACE IN COUNTRY'S DEVELOPMENT:

The Sheep and Wool Industry plays an important role in the economy of the country. Millions of families are provided with sustenance by this industry including sheeps farmers, shearers, village wool spinnors, weavers of blankets, and carpets, petty dealers of wool as well as big brokers, exporters of wool, industrialists, concerning manufacturers of and products of wool, mill workers and many others.

About half the quantity of 76 million pounds of raw wool produced in the country by about 42 million sheep is exported to foreign countries and provides valuable foreign exchange. Millions of skins are also exported to foreign countries besides, Guts and other products.

The sheep industry provides about 400 million pounds of mutton as a valuable animal protein food for human population and the valuable manure for augmenting food production.

It is therefore obvious that the development of the country is intertwined with the development of sheep and wool industry and it is imperative to undertake concerted measures in the matter. The establishment of Central Sheep and Wool Research Institute is thus an important mile stone in the development of progress of the country.

10. NAME OF THE INSTITUTION INDIAN LAC RESEARCH INSTITUTE, NAMKUM, RANCHI

YEAR OF ESTABLISHMENT: 1925

NAME OF THE DIRECTOR: Dr. G.S. Misra,

AIMS AND FUNCTIONS:

This Institute is organised mainly for the purpose of improvement in the cultivation of lac, manufacture of shellac and utilisation of shellac through scientific research. Main functions of the organisation is to carry out research on Entomology of Lac Insects, Cultivation of Lac, Processing of Lac, Chemistry of Lac Resin and Utilisation of Shellac.

STAFF:

Scientists.	12
Auxillary.	107
Administrative staff.	92
Total	211

MAIN DIVISIONS:

1. Entomology.
2. Chemistry.

MAIN ACHIEVEMENTS:

1. Various problems connected with lac cultivation and utilisation of shellac and also in refining of lac have been worked on by this Institute.
2. Improved cultivation of lac.
3. Improved methods of refining lac.
4. New methods of making use of shellac for different purposes.
5. Development of a single pack etch primer for non various metal surface, heat and water proof furniture polish, methods of production of seedlac of improved quality and finding out *Moghania macrophylla* as an alternate host tree for kusum lac cultivation.

Main research facilities and equipments:

The Institute maintains Entomological Laboratory with equipments required for entomological study of the lac insects and the Chemical Division is equipped with facilities to carry out work on the process of refining lac, to develop new uses of shellac in surface coating and as plastics.

PUBLICATIONS:

Reports are mainly published in English. If required some of them are rendered into regional languages.

PLACE IN COUNTRY'S DEVELOPMENT:

This is the only Institute in the country to work on the problems related with lac cultivation and utilisation of shellac. For the development of the lac industry in the country this Institute is the main organisation to assist in the developmental work.

11. NAME OF THE CENTRAL ARECANUT RESEARCH STATION
INSTITUTION VITTAL POST, MYSORE STATE

YEAR OF ESTABLISHMENT: 1956

NAME OF THE DIRECTOR: Shri K.V. Ahamed Bavappa

AIMS AND FUNCTIONS:

The Station is charged with the function of:

1. Solving the regional problems confronting the arecanut industry.
2. Conducting fundamental and applied research on the crop.
3. Guiding and co-ordinating the research work carried out at the regional stations.
4. Serving as a centre of information on all matters relating to the crop.

STAFF:

Scientists.	45
Auxilliary Technical Staff	43
Administrative Staff.	52
Total	140

MAIN DIVISIONS:

1. Botany.
2. Agronomy.
3. Statistics.
4. Chemistry.
5. Physiology.
6. Pathology.
7. Entomology.

MAIN ACHIEVEMENTS:

1. Development of criteria for selection of mother palms, seednuts and seedlings and standardisation of nursery practices:
2. Field planting and manuring: In the spacing trial (commenced in 1958), observations made on the yield characters have indicated that the optimum spacing is the one which provides each tree and area of 6.7 to 7.5 sq. meter.
3. In the experiment intended to find out the effect of growing banana in arecanut gardens, the initial growth of palms during the first three years was found to be not affected by the banana population present in the plots.
4. Research work done on control of pests such as mites, root grub, inflorescence caterpillar, and diseases such as fruit-rot, collar-rot, stem breaking, band disease, etc.
5. A crop forecasting procedure by a sample count of the final fruit-set of approximately three per cent of the tress in a randomly selected population has been worked out.
6. Study was made on the distribution of root system of arecanut palm.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

A very well equipped laboratory for work in various disciplines is available at Vittal. At the Regional Arecanut Research Station, field laboratories with sufficient equipments to do the laboratory investigations of routine nature are also available. A library of moderate size is in existence at Vittal.

PUBLICATIONS:

- (a) Annual reports of the research work done at the Central and Regional Stations is published annually in English. Reports for the year 1958-59 to 1964-65 have already been brought out.
- (b) Technical Bulletines as and when materials are available. The No. 1 issue on bibliography on Arecanut has already been published.

PLACE IN COUNTRY'S DEVELOPMENT:

Arecanut occupies an eminent part in the country's economy. Latest figures show that 4 million people are dependent on this crop for their living. Besides, India is short of its requirement of this commodity by about 1/5th of the requirements. Due to this about 20 lakhs of rupees worth produce is being imported to the country every year. Achieving self sufficiency is therefore of utmost importance.

12. NAME OF THE INSTITUTE JUTE TECHNOLOGICAL RESEARCH LABORATORIES
INSTITUTION 12, REGENT PARK, TOLLYGUNGE, CALCUTTA-40.

YEAR OF ESTABLISHMENT: 1938

NAME OF THE DIRECTOR: Dr. P.K. Saha,

AIMS AND FUNCTIONS:

1. To undertake technological research in the interests of the jute industry in India.
2. To find out new and extended uses of jute and allied bast fibres and their sticks.

STAFF:

Scientists and Technologists.	7
Auxiliary Scientific Staff.	7
Auxiliary Technical Staff.	33
Administrative Staff.	13
Total	60

MAIN DIVISIONS:

1. Experimental Spinning Mill.
2. Chemistry Section

3. Physics and Applied Physics.
4. Chemical Technology.
5. Testing.
6. Library.

MAIN ACHIEVEMENTS:

1. A technique of assessing the quality of jute by spinning only 10 lb on full scale jute machinery was developed.
2. A method of predicting the quality ratio from two physical fibre characters when samples are too small for spinning, was also devised, and subsequently followed.
3. Change of cross-sectional area with variation of relative humidity, crystalline length and width of substitute fibres as well as the influence of hemicellulose on the crystalline structure of holocellulose were investigated by means of x-ray.
4. Different physical properties of jute fibre, such as breaking strength, swelling, flexural modulus, static friction of jute filaments, flexural elasticity and hardness have been measured.
5. For assessment of spinning quality, different characters of the fibre, such as fineness, meshiness, filament length, irregularity, density, strength etc. were determined.
6. For the correlation of yarn characters with chemical characters, statistical analysis was made. From the results, a prediction of yarn quality of jute samples, without a reference to the variety, has been possible.
7. Effect of biuning of jute fibre prior to spinning into yarn was studied.
8. Accessible portion of various cellulose preparations from jute has been determined by the method of acid hydrolysis.
9. Bleaching of jute with sodium chlorite and hydrogen peroxide was studied in details.
10. A simple and economic method of softening hard root cuttings of jute has been developed.
11. A cheap and simple process of brightening hessian, made from dark coloured jute, was developed and a patent taken.

12. The woollenisation of jute has been done satisfactorily. Blankets, wrappers and knitting wools of moderately good quality at a reasonable cheap cost, were produced. The dyeing and softening details were worked out. Some firms are now making blankets from woollenised jute and Indian wool.
13. Non-woven fabrics have been made from jute or jute waste, which are suitable for making cheap bookbinding cloth and rexine type of material. A patent has been taken.
14. A flexible roofing material with jute stick pulp mainly was made and details published for the industry.
15. Details have been worked out for making rayon-grade pulp from jute sticks. The quality of the pulp compares favourably with the imported pulp, in chemical aspects. Improved samples have been sent to Germany and Japan for trial.
16. The process of producing will covering from bleached and suitably dyed hessian for foreign market, particularly, U.S.A. has been completed. Some concerns are making these on a modest scale for decorating purpose.
17. A balance-type fibre strength tester has been designed which can be conveniently used for measuring the strength of jute and mesta fibre.
18. A portable spring-type tester has also been developed and a patent taken.
19. A portable instrument has been developed for assessing fineness of jute fibre. It may be helpful in grading jute and mesta.
20. Samples of nitrocellulose prepared from jute and mesta stick cellulose were sent to Messrs. Imperial Chemical Industries to test the suitability of the

material as a laquer base. Satisfactory reports have been obtained.

Substitutes for batching oil in jute spinning - If it is desired to replace batching oil completely in spinning jute for special years, 0.25% glycerine and 24% water on the weight of fibres may be used with a reduction in yarn tenacity by 5-6% in the Rove spinning system and about 9% in the aliver spinning system. If a little mineral oil is permissible; 0.25% glycerine and 0.25% batching oil may be used without in any way affecting the yarn qualities.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

Almost all essential scientific apparatus and equipments are available in J.T.R.L. for doing physical, chemical, technological and microbiological researches on jute and allied fibres. Mill machinery for spinning and weaving on a small scale are available. Pilot plants for dyeing, calendering and coating machines etc. have been installed in J.T.R.L. Machinery for producing non-woven fabrics exist in these laboratories. Various testing machines for fibres, yarns, cloths, papers boards etc., under controlled conditions of temperature and humidity, are in J.T.R.L. A fairly well-equipped workshop for all sorts of repair works and fabrication of instruments as per designs is attached to the J.T.R.L.

PUBLICATIONS:

Research results are published in English in pamphlets and brochures which are priced publications and also in annual and adhoc reports which are for official use only.

PLACE IN COUNTRY'S DEVELOPMENT:

Research Laboratory - Grade III under I.C.A.R.

13. NAME OF THE INSTITUTION JUTE AGRICULTURAL RESEARCH INSTITUTE
NILGAUNGE, P.O. BARRACKPORE (W.B.)

NAME OF THE DIRECTOR: Dr. T. Ghosh,

AIMS AND FUNCTIONS:

Systematic research work on jute was started in 1939 with the establishment of the Indian Central Jute Committee. The Jute Agricultural Research Institute was established at

Dacca in the same year. With partition of India in 1947, the Jute Agricultural Research Institute was reorganised in India in 1948.

This Institute, so long functioning under an autonomous body, viz., Indian Central Jute Committee, was taken over by the Indian Council of Agricultural Research with effect from 1.4.65 with the intention of intensifying and coordinating researches on bast fibres, in general and jute in particular.

Bast and leaf fibre crops under study are jute, mesta, sunnhemp, ramie and sisal. Research Stations have been opened at Sorbhog (Assam), Barra (Orissa) and Pratapgarh (U.P) in 1960, 1962 and 1963 for ramie, sisal and sunnhemp respectively.

STAFF:

	Scientists and Technologists	Auxiliary technical staff.	Adminis- trative & Accts. staff.	Non- tech- nical staff.
Jute Agril. Research Institute	90	35	26	32
Ramie Research Station.	11	4	1	4
Sisal Research Station.	13	5	2	3
Sunnhemp Research Station.	13	6	2	5
Total	127	50	31	44

MAIN DIVISIONS:

- I. Jute Agricultural Research Institute, Nilganj, BKP.
1. Section of Plant Breeding and Genetics.

Genetics.
Plant Breeding
Cytology
Anatomy

2. Section of Agronomy.

Agronomy

Farm

3. Section of Agricultural Chemistry and Microbiology.
4. Section of Mycology and Plant Pathology.
5. Section of Entomology.
6. Section of Plant Nutrition.
7. Agricultural Engineering Workshop.
8. Extension Wing.
9. Statistics Section.
10. Library and Museum.
11. Artist.
12. Administration and Accounts Wing.
- II. Ramie Research Station, Sorbhog, Assam.
- III. Sisal Research Station, Bamra, Orissa.
- IV. Sunnhemp Research Station, Protagarh, U.P.

MAIN ACHIEVEMENTS:

Jute

Tossa Jute: Olitorius

White Jute: Capsularis

Mesta

Hibiscus sabdariffa

Hibiscus cannabinus:

Spacing and mechanization of jute cultivation.

Control of weeds with weedicides.

Crop rotation of different intensity to find effects on soil fertility as well as impact on the economy of a farming unit.

Standardization of economic use of fertilizers in jute fields with different cropping practices. .

Use of nitrogen from urea as foliar application. The limits of tolerance of concentrations of urea are under investigation.

Study of various cropping practices involving jute and one food crop or even a third crop to suit one or other jute tract.

Uptake of phoshate by jute and other crops in rotation. Designing a prototype of sisal decorticating machine.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

Land - 62.5 ha - - - at Jute Agricultural Research Institute.

60.0 ha - - - at Bamie Research Station, Sorbhog Assam.

106.4 ha - - - at Sisal Research Station, Bamra, Orissa.

12.28 ha - - at Sunnhemp Research Station, Pratapgarh, U.P.

Laboratory facilities Usual laboratory equipments, etc. special facilities available are:-

- 1) X-ray and gama-ray (Co-60) for mutation work.
- 2) Radiotracer laboratory for Soil plant nutrition relationship studies.

Building facilities:

- 1) The Institute has a good auditorium.
- 2) Residential facilities for staff.
- 3) Hostel building for trainees.

PUBLICATIONS:

Prior to taking over the Indian Central Jute Committee by the I.C.A.R., the Secretary, Indian Central Jute Committee was publishing the Jute Bulletin and the Annual Reports of Research Institutes. These were in English language. Publication is now being done by the I.C.A.R. for the Annual Reports and the Director (Jute Development), Government of India, Ministry of Food, Agriculture, C.D. and Cooperation, 4, K.S. Roy Road, Calcutta for the Jute Bulletin. Publicity Officer attached to I.C.J.C. used to bring out leaflets and

pamphlets in Bengali, Hindi and English for dissemination of research results to farmers in improved agricultural practices for Jute & allied fibre crop cultivation.

PLACE IN COUNTRY'S DEVELOPMENT:

Jute Industry earns Foreign Exchange around 180 crores and 7 lakh people are directly or indirectly dependent on it.

14. NAME OF THE INSTITUTION CENTRAL TOBACCO RESEARCH INSTITUTE
RAJAHMUNDRY

NAME OF THE DIRECTOR: Dr. D.M. Govinath.

AIMS AND FUNCTIONS:

Fundamental and applied research with special reference to flue-cured Virginia and lanka tobacco grown in the area.

Applied research is being conducted on both the nursery and field phases of the crop. In the nursery, efforts are directed towards evolving suitable practices for heavy black-cotton soils and sandy soils that would ensure good germination and would promote the production of healthy and vigorous transplants. With regard to the field crop, attention is paid mainly to finding out suitable practices which would promote the yield and quality of flue-cured tobacco.

Attached to the Institute are 5 regional research Stations one each at Veda sandur (Madras for cigar, cheroot and chewing tobacco, at Pusa (Bihar) for hookah and chewing tobacco, at Dinhat a (West Bengal) for wrapper and hookah tobacco, at Hunsur (Mysore) for flue-cured Virginia and country tobacco, and at Guntur (Andhra) for flue-cured Virginia and natu tobacco. The Institute co-ordinates the work of these research Stations as well as of other Research Schemes financed by I.C.A.R. from time to time.

STAFF:

<u>STAFF:</u>	<u>Institute</u>	<u>5 Regional Research Station</u>
Scientists.	12	5
Research Staff.	50	17
Auxillary Technical Staff.	62	47
Administrative and other Staff.	75	68

MAIN DIVISIONS:

1. Agronomy.
2. Agricultural Chemistry.
3. Plant Physiology.
4. Plant Breeding and Cytology.
5. Plant Pathology.
6. Entomology.
7. Technology.
8. Statistics and Training.
9. Demonstration.

MAIN ACHIEVEMENTS:

1. Agronomy: Research work has indicated that to-bacco stalk which ties appeared to be superior than other types of covers, in protecting the nursery beds raised on heavy blackcotton soils.
2. For increasing the yield of flue-cured Virginia tobacco consistant with quality, it was found by research investigations that giving one irrigation to the crop 40 days after trans-planting was found to be superior over no irrigation.
3. Research investigations has also indicated that both yield and quality of the leaf improve when tobacco was planted immediately after green gram in khari in one-year rotation cycle. In two-year rotation cycle, rotation with paddy chillies in the first year and fallow-tobacco in the 2nd year was found to be encouraging both from the yield and quality point of view.
4. Plant Breeding: Based on three year' results the newly evolved selections H.R. 62-1, 3,5,6,7, 9 and 12 were found to give higher cash return as compared to the standard flue-cured varieties Delcrest, Hicks and Virginia Gold. These selections are in various stage of District trials and among these, selections H.R. 62-3, 7 and 9 have become popular with the growers and these are being tried on a restricted scale in selected growers' fields.
5. Delcrest, continued to top the list, among the other four popular varieties under commercial cultivation, in trials carried out in the Districts of Guntur, Krishna, East and West Godavari, till such time the improved strains mentioned above were included in these trials.

6. Agricultural Chemistry: A method for chemical examination of tobacco from bales to distinguish "Saline tobacco" for the purpose of Agmarking was evolved, and is being used officially by the Marketing Directorate.
7. On the basis of biochemical investigations so far carried out it was possible to formulate quality indices such as Shmuk numbers, Kovalenko Co-efficients, etc. which are the ratios of chemical constituents like total sugars, reducing sugars, total nitrogen and protein nitrogen and elucidate their relationship to the Agmark grades. As a result of this work a new system of grading based on stalk position has been developed.
8. Plant Physiology: It was found by research investigations that germination of tobacco seed could be improved by treating the seed with a 1000 ppm. solution of gibberellic acid. The seed treated with gibberellic acid could be stored for two months in a dry condition after treatment without any loss in germinating power.
9. Plant Pathology: Among the five fungicides viz. (i) Bordeaux mixture, (ii) Kirticopper W.P. 50 (cuprous oxide), (iii) Kirti copper W * P-50 (copper oxy chloride), (iv) Microcop (copper oxychloride) and (v) Dithane M-22 (Manganese ethylene bisdithiocarbamate), tried for the control of at 2 concentrations of 0.125 and 0.250 per cent excepting Bordeaux mixture where the concentrations were 0.2 and 0.4 percent. Bordeaux mixture 0.4 per cent and Kirticopper 0.25 percent gave significantly better control over the other fungicides.
10. For effective control of root-knot nematode in the nurseries, treating the beds with the chemicals D. D., Dowfume W. 85 and Durlone and adopting the cultural practice of raking the seed-beds were found to be beneficial on research investigations.
11. Entomology: For the control of leaf eating caterpillars in the nursery, among the now insecticide tried, Endosulfa, DDVA and I-naphthyl carbamate had shown very good promise. It has been found that the insecticides acting as systemics as well as contact were in no way superior to non-systemic ones viz. DDT.
12. Frumin, a granular systemic insecticide was found to give very high mortality upto 5 weeks after application and was outstanding in controlling aphids on Lanka tobacco compared to all other insecticides.

13. Technology:- It was observed that mild fermentation of cigarette tobacco at $45 \pm 1^{\circ}\text{C}$ at a moisture range of 18% for a period of three weeks, improved the leaf quality.
14. Depending upon the reducing properties of some of the aroma bearing constituents of tobacco a chemical method for the technical assessment of tobacco leaf aroma has been developed and standardised. The method was found to be useful in some of the breeding experiments concerning the improvement of aroma in flue-cured Virginia tobacco.
15. An apparatus has been designed and fabricated for measuring the elastic properties of tobaccos which are important from the quality point of view.
16. Seed distribution:- Production and distribution of pure seed and seedlings is one of the important services the Institute is rendering to the growers. The entire flue-cured Virginia tobacco growing tract of Andhra Pradesh depends upon the Institute's seed for raising the crop. Against an annual target of 3,500 kg. it has been possible to produce about 13,000 kg. during 1965-66 for distribution to the growers.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Institute has got its own laboratory for the different disciplines well equipped for carrying out the programme of work envisaged from time to time. For carrying out field investigation an experimental farm of about 112 acres is attached to the Institute. The Institute is also having a well equipped library.

PUBLICATIONS:

The Institute was publishing leaflets on the various aspects of tobacco production viz. (i) raising of nurseries, (ii) improved cultural practices for the field crop, (iii) varietal improvement, (iv) control of pests and diseases, (v) improved curing techniques, etc. of the different types of tobaccos based on experimental findings, for the benefit of the growers in English and other regional languages till its merger with I.C.A.R. in October, 1965. The Institute is however publishing its Annual Report and that of the Regional Research Stations attached to it, in English.

PLACE IN COUNTRY'S DEVELOPMENT:

The part played by tobacco in the national economy of the country needs no overemphasis. India is the third biggest producer and exporter of tobacco in the world. Tobacco is India's fifth biggest foreign exchange earner (about Rs. 250 crores annually), although only 0.28% of the country's total cultivated area is under this crop. As against 43.4 million kg. of unmanufactured tobacco in 1956-57, India exported in 1964-65 78.1 million kg. of all types of tobaccos of which flue-cured Virginia tobacco accounted for 85.4%. The Central Excise revenue from tobacco during 1964-65 was Rs. 960.5 million as against Rs. 379.7 million in 1956-57.

15. NAME OF THE INSTITUTION CENTRAL COCONUT RESEARCH STATION,
KAYANGULAM, KERALA.

YEAR OF ESTABLISHMENT: 1947

NAME OF THE DIRECTOR: Dr. S.B. Lal

AIMS AND FUNCTIONS:

1. To conduct investigations on the epidemiology of the important diseases and pests of coconuts, carry out fundamental and applied research on the various aspects of disease and pest infestation and to evolve suitable control measures.
2. To maintain nucleus culture of the parasites for biological control of leaf eating caterpillar and supply of the same to the zonal parasite breeding stations.
3. To render advice to coconut growers and impart training in plant protection measures to extension workers and cultivators.

STAFF:

Scientists.	6
Other Technical Staff.	54
Administrative Staff.	24
Total.	84

MAIN DIVISIONS:

1. Entomology.
2. Plant Pathology.
3. Soil Chemistry.

MAIN ACHIEVEMENTS:

Diseases: Three diseases of the coconut palm prevalent in Kerala, namely, root (wilt), leaf rot and stem bleeding diseases have been under investigation.

Pests: Of the several pests of coconut palm those causing considerable damage to coconut gardens as the rhinoceros beetle and a few others of minor importance such as the slug caterpillar, mites, termites etc. are under investigation. Effective control measures have been evolved for most of the pests.

General: While intensifying researches on all aspects of coconut diseases and pests, large scale field experiments for their control are concurrently laid out in cultivators gardens in various parts of Kerala. A scheme embodying the results of researches for improving the crop and thereby increasing production was launched in 1964 in 50 acres of coconut garden in Kuttanad (Alleppey District), which is one of the worst affected areas.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

This Research Station has facilities and equipment for conducting investigations/studies on the biology and control of the pests and on the mycological and virological aspects of coconut diseases.

PLACE IN COUNTRY'S DEVELOPMENT:

India is a major coconut growing country but is not self sufficient in this commodity. The gap between our requirements and production is partly due to poor yield for various reasons. One of the important factors leading to low yields is the incidence of diseases and pests affecting the crop.

The Central Coconut Research Station, Kayangulam is the only research station carrying out researches on diseases and pests of coconuts in the country and holds an important position particularly because it is engaged in research in the problem of root (wilt) disease.

16. NAME OF THE INSTITUTION CENTRAL COCONUT RESEARCH STATION,
KASARAGOD

YEAR OF ESTABLISHMENT: 1947

NAME OF THE DIRECTOR: Shri M.C. Nambiar

AIMS AND FUNCTIONS:

The main object of this Research Station is to promote fundamental and applied research on the agricultural aspects of the coconut crop.

STAFF:

Scientists.	28
Auxiliary Staff.	25
Administrative Staff.	47
Total.	100

MAIN DIVISIONS:

1. Agronomy.
2. Botany and
3. Chemistry.

MAIN ACHIEVEMENTS:

1. Agronomy: The importance of regular intercultivation and manuring of coconut gardens for maintaining the yield at a high level was demonstrated from field

experiments. In respect of nut quality, nitrogen had an adverse effect on all characters while potash had very beneficial effects. This experiment also showed that initially poor yielding palms responded better than high yielders. Among the different methods of fertilizer application tried, broadcasting was found to be as good as the conventional method of basin application. Young palms growing in sandy soil and not yet in the bearing stage appear to need nitrogen more than phosphoric acid or potash.

Management studies on the cover-cum-green manure crop of Calopogonium mucunoides showed that incorporating the crop every year is more beneficial than leaving the crop without incorporation. Manuring the coconut palm either directly or through the cover crop is equally beneficial.

Studies on the frequency of irrigation of newly planted seedlings in sandy soil showed that application of red earth in the seedling pits at the time of transplanting helps to lengthen the interval between irrigations up to 8 days without any harmful effects on vegetative growth.

2. Botany and Breeding: To spot cut coconut varieties with desirable characters, a number of varieties and forms, both exotic and indigenous, have been introduced from time to time for trial.

Hybridisation, another method of evolving new lines with desirable characters such as high yield, early bearing, etc., was under investigation in its different aspects. The Tall x Dwarf hybrids, planted as early as 1940, continued to give very satisfactory performance.

Cytological investigations recorded on different varieties and forms of Cocos nucifera have helped to understand the mode of origin of dwarf palms and further, to understand the effect of inbreeding on sex expression and lethality of gametes in coconut.

3. Chemistry: Five major groups of soils were identified in the coconut areas of Cannanore District, which were under survey. Study of the nutrient status showed the coastal plain and the lowland valley soils to be very poor and subject to considerable drought. The laterite, alluvial and reclaimed soils are fairly well supplied with nitrogen and organic matter but low in available potash and phosphate. The red soils while possessing favourable physical features are lacking in plant nutrients especially nitrogen and potassium. Besides nutrient deficiency, the inadequate, unsystematic and unbalanced manuring also pulled down yields. Methods of improving the production have been suggested to the growers. Studies on the soil-plant nutrient correlations in the coconut palm showed manuring to have good influence on the foliar nitrogen and potash status. Preliminary pot culture experiments with seedlings gave evidence of differential growth response to phosphate sources. Variation in leaf composition due to soil type, yield capacity, etc., is under study. Biochemical studies with particular reference to enzyme activity in haustorium of germinating seedlings, in coconut water and in coconut tissues under healthy and abnormal conditions have been taken up. Preliminary results indicate that enzyme activity in coconut water is influenced greatly by the cultural and manurial practices given to the palms and that it could possibly afford scope for using it as a diagnostic measure to assess the nutrient needs of the palm.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

Facilities are available to a limited extent to carry on research work on the botanical, agronomical and chemical aspects of the coconut palm. We have a fine collection of living material of a good number of exotic and indigenous cultivars of coconut, different soil conditions to conduct field experiments on the different agronomical practices, and laboratory facilities for carrying on laboratory investigation on physico-chemical characteristics of soils, soil testing and preparation of soil maps as also for soil and plant tissue analysis. A fairly good collection of books and up-to-date foreign and Indian journals are being maintained in the Library for reference.

Some of the important equipments available in the Station are as follows:-

Lovibond Tintometer.
Muffle furnace.
Shaking machines.
Sieve shaking machine.
Sextet Extraction Apparatus.
Conductivity Bridge (Mullard type)
Thermostatic electric oven (Mammert-German)
Electric muffle furnace (Therelok).

PUBLICATIONS:

This Research Station does not issue any publications of its own. The scientific and popular articles written by the staff of the Station used to be largely published, till recently, in the Indian Coconut Journal and the Coconut Bulletin of the now defunct Indian Central Coconut Committee. The Indian Coconut Journal has since ceased publication. Article for publication are now being sent to the Indian Council of Agricultural Research for publication in "The Indian Journal of Agricultural Science" and "Indian Farming".

This Station has so far sent out for publication a total of more than 125 articles, both scientific and popular, in English.

PLACE IN COUNTRY'S DEVELOPMENT:

The coconut crop (Cocos nucifera) is of considerable importance in international trade as a source of coconut oil and coir goods. From the point of view of world acreage and production, India occupies the second place, next to the Philippines, with a total acreage of about 7.3 lakh hectares under the crop and an estimated annual production of about 4,300 million nuts. The production is insufficient to meet even the internal demand and we are importing coconut worth about Rs. 6-10 cores. every year.

17. NAME OF THE SUGARCANE BREEDING INSTITUTE
INSTITUTION COIMBATORE

NAME OF THE DIRECTOR: Dr. J. Thuljaram Rao

AIMS AND FUNCTIONS:

1. To breed improved sugarcane varieties for all the cane tracts of the Indian Union.

2. To conduct fundamental research on the botany and cyto-genetics of sugarcane as also on certain physiological, chemical, mycological and entomological aspects of sugarcane.
3. To impart post-graduate training in sugarcane breeding and botany.

STAFF:

(i) Scientists. (Graduate and above)	30
(ii) Auxiliary Personnel (Sub Assistants, Plant Collectors, Laboratory Attenders etc.)	27
(iii) Administrative Staff.	15
Total.	72

B. REGIONAL SUGARCANE SUBSTATION, KARNAL (HARYANA)

(i) Scientists (Graduate and above)	3
(ii) Auxiliary Personnel (Sub Assistants, Plant Collectors, Laboratory Attenders etc.)	2
(iii) Administrative Staff.	1

C. REGIONAL SUGARCANE SUBSTATION, LUCKNOW (UTTAR PRADESH)

(i) Scientists (Graduate and above)	1
(ii) Auxiliary Personnel (Sub- Assistants, Plant Collectors, Laboratory Attenders, etc.)	1
(iii) Administrative Staff.	nil

D. REGIONAL SUGARCANE SUBSTATION, MOTIHARI (BIHAR)

(i) Scientists (Graduate and above)	1
(ii) Auxiliary Personnel (Sub-Assts, Plant Collectors, Laboratory Attenders etc.)	1
(iii) Administrative Staff.	nil

E. WEST COAST REGIONAL SUGARCANE SUBSTATION, CANNANORE
(KERALA STATE)

- | | | |
|-------|--|-----|
| (i) | Scientists (Graduate and above) | 1 |
| (ii) | Auxiliary Personnel (Subs-Assistants, Plant Collectors, Laboratory Attenders etc.) | 1 |
| (iii) | Administrative Staff. | Nil |

F. P.L. 480 PROJECT ON SCHEME FOR HYBRIDISATION OF US
AND CLONES OF SUGARCANE:

- | | | |
|-------|--|----|
| (i) | Scientists (Graduate and above) | 12 |
| (ii) | Auxiliary Personnel (Laboratory Attenders) | 2 |
| (iii) | Administrative Staff. | 6 |

MAIN DIVISIONS:

A. SUGARCANE BREEDING DIVISION comprising of:

- (i) Breeding Section.
- (ii) Genetics Section.
- (iii) Botany Section.
- (iv) Cytogenetics Section.

B. SUGARCANE PHYSIOLOGY DIVISION.

C. SUGARCANE CHEMISTRY DIVISION.

D. PLANT PATHOLOGY DIVISION.

E. AGRICULTURAL ENTOMOLOGY DIVISION.

F. FARM.

The Director is also Head of the Division of Sugarcane Breeding.

MAIN ACHIEVEMENTS:

The Sugarcane Breeding Institute, Coimbatore was established in 1912 charged with responsibility of breeding improved varieties for the sub-tropical parts of India, wherein lies the bulk of the sugarcane area. In 1924, the Institute was taken over by the Government of India and functioned as a part of the Imperial Agricultural Research Institute, Fusa (new Indian Agricultural Research Institute, New Delhi). In 1926, the breeding work for evolving suitable varieties for tropical India was initiated.

The work of the Institute on the botanical side regarding the morphology and classification of the Indian canes has provided exhaustive knowledge. The deliberate utilisation of the wild S. spontaneum in breeding (for the first time in the sugarcane world) and which was later adopted in Java, was responsible for the success of the Co. canes as it introduced the needed hard-ness and frost resistance into the seedling. Both the above important lines of studies have won for the Institute a recognition as one of the leading centres of research on sugarcane. The inter-generic hybridisation attempted (again for the first time) at this Institute is well known in the botanical world. The sugarcane x Sorghum crosses and sugarcane x bamboo crosses have been acclaimed as of considerable importance from the academic and scientific points of view. The Institute can be said to be the pioneer in the study of the root system of sugarcane, a knowledge of which is so valuable to the sugarcane breeder and agronomist.

The sugarcane variety is the pivot round which revolves the sugar industry. The Institute by sustained research, has produced improved sugarcane varieties to suit the diverse soil and climatic conditions and the varying needs of the white sugar and gur industries. These have formed the backbone of the industry. With the increase in acreage under improved varieties, the yield per acre has also risen up.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Institute is fairly satisfactorily provided with research facilities and equipments for its work.

PUBLICATIONS:

- (1) Annual Reports of the Institute in English.
- (ii) Scientific articles in English in Journals in the country and abroad.

PLACE IN COUNTRY'S DEVELOPMENT:

The Coimbatore Institute was founded to fulfil a definite need of the Indian Sugar Industry, viz., to breed new varieties of sugarcane to replace the old indigenous varieties which were notoriously poor in yield giving hardly 10 tonnes of cane per acre. This objective has been fully achieved. The birth of a new era in Indian sugar industry is closely linked with the activities of the Institute, which has, during the past over four decades strived to evolve improved varieties, firstly for subtropical India and since the year 1926 for tropical India as well. The improved hybrid Co. varieties provided the much needed raw material for the industry and the best evidence of the achievements of the Institute is a established sugar industry in India as witnessed today. The grant of fiscal protection in the year 1931 gave the needed fillip to the renaissance of the sugar industry. From a country importing sugar to the tune of about Rs. 150,000,000 annually, India is now not only self-sufficient but has entered the world market.

The Institute is the only one of its kind in the country. The best evidence of the place of the Institute in the Country's development is a established sugar industry in the country.

18. NAME OF THE INSTITUTION INDIAN INSTITUTE OF SUGARCANE RESEARCH, LUCKNOW-2.

YEAR OF ESTABLISHMENT: 1954

NAME OF THE DIRECTOR: Shri R.R. Panje

AIMS AND FUNCTIONS:

To conduct researches on the more fundamental aspects of sugarcane agriculture and for the coordination of researches done on this crop in the different States.

STAFF:

Scientific and Technological Officers.	13
Research Assistants.	14
Auxiliary Technical Staff.	106
Administrative Staff.	49
Total.	182

MAIN DIVISIONS:

1. Agronomy.
2. Plant Physiology.
3. Agricultural Engineering.
4. Mycology.
5. Entomology and
6. Soil Science.

MAIN ACHIEVEMENTS:

1. Agronomy: One of the important achievements is in the improvement in the germination and quality of seed cane. Several new cultural techniques have been evolved. It is possible now by adopting some of these, to intensify rotations of crops, get very good yields in late planted cane, have gapless stands and improve the efficiency of various inputs.
2. Agricultural Engineering: A number of machines have been developed of which the bullock-drawn and tractor-drawn planters, bullock-drawn Weeder-Mulcher and bullock-drawn fertilizer applicator need special mention.
3. Soil Science: For improving fertilizer practices, basic information on the pattern of nutrient uptake by the crop has been probed, and possibilities of improving fertilizer efficiency opened up.
4. Plant Physiology: Techniques of suppression of flowering in sugarcane have been developed and they hold promise in increasing the yields of sugarcane and sugar per hectare in areas where sugarcane flowers profusely.
5. Plant Pathology: Studies on fungal and virus diseases and nematodes has resulted in evolution of control measure for these. Heat therapy units for the control of virus diseases have been evolved.
6. Entomology: Survey of insect pests conducted in different States resulted in interesting information on the spread of these pests. Control measures against shoot borers, termites and other pests have been worked out.

7. Sugarbeet: As a result of a number of cropping tests conducted by this Institute for the cultivation of sugarbeet in different parts of the country it has now been established that the prospects for setting up of beet sugar industries are good in North-Western India.

MORE PROMINENT ACHIEVEMENTS:

1. The new I.I.S.R. sugarcane planting technique for high yields in short duration.
2. I.I.S.R. improved techniques for flat planting.
3. The deep-furrow trach-vein system of planting.
4. The I.I.S.R. technique for raising cane in alkaline soils.
5. I.I.S.R. summer and winter nursery systems for planting cane.
6. Trash mulching in cane.
7. Cane culture in Sandy Soils Modified rayungans system of planting cane (under investigation).
8. The I.I.S.R. Tractor-drawn planting machine.
9. The I.I.S.R. Bullock-drawn planting machine.
10. The I.I.S.R. Weeder-Mulcher.
11. The I.I.S.R. Low-head water lift.
12. The I.I.S.R. Inter-Crop Seed drill.
13. The I.I.S.R. Fertilizer Applicator.
14. The I.I.S.R. Sugarcane Stripper.
15. The I.I.S.R. Juice Sampler.
16. Production of Agrade seed.
17. The I.I.S.R. technique of flower control.
18. The I.I.S.R. Heat-treatment unit.
19. Improved fertilizer efficiency.
20. Control of Red rot, Rust and Smut.
21. Control of shoot-borer.
22. Control of other insect pests according to occasion.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

All the sugarcane research sections are provided with laboratories. The Engineering Section has a workshop for designing and fabricating prototypes of new implements and for other mechanical work. The major laboratory facilities available are as follows:

- | | |
|--|--|
| 1. <u>Agronomy Section:</u> | One field laboratory. |
| 2. <u>Soil Science and
Agricultural Chemistry.</u> | One analytical laboratory
One radio-isotope Lab.
One instrument room.
One net house.
One set of lysimeters. |
| 3. <u>Soil Microbiology:</u> | One Laboratory.
One culture closet. |
| 4. <u>Plant Physiology.</u> | One analytical laboratory. |
| 5. <u>Agricultural
Engineering.</u> | One workshop.
One draftsman room. |
| 6. <u>Mycology.</u> | One laboratory.
One field laboratory.
One virus laboratory.
One cold room.
One culture room.
One glass house. |
| 7. <u>Entomology.</u> | One Laboratory.
One field laboratory.
One field cage (at present
damaged by cyclone)
One biological control
laboratory. |

PUBLICATIONS:

No. of publications in different Sections.	223
No. of publications in I.I.S.R. Newsletters. (Entomology Section)	10

PLACE IN COUNTRY'S DEVELOPMENT:

The Insitute was stablished because the researches conducted on sugarcane in the different States during the past 30 years had reached the end of their tether. The limitations on production were such that no further.

progress in research was possible until certain fundamental problems had been solved. New varieties were being evolved incessantly and supplied to northern States, but they were not helping to raise the average yield, and instead they were getting progressively infected with diseases and pests and deteriorating one after the other. Such potential as the varieties had was itself not being realised. These which were of a more fundamental nature, were taken up by the Institute at Lucknow: their general scope was to probe into the causes of plant's observed behaviour and to understand the interactions of soil, plant climate and inputs.

Seven years' work has disclosed certain new facts about sugarcane and revealed avenues of possible improvement which are altogether new. Through Coordinated researches, these have now been translated into practical possibilities.

These results are not to be tested in the regional sugarcane stations and spread among farmers. The probability is that with these results the yield level in cane in north India can be now greatly increased or alternatively the costs of production brought down steeply. Many diseases and pests can be now controlled. The new lines opened up would offer fruitful avenues to regional stations for further research.

The Institute also taken up special research schemes, surveys and assessments and pilot projects for commercial use.

19. NAME OF THE INSTITUTION CENTRAL INLAND FISHERIES RESEARCH INSTITUTE,
BARACKPORE, WEST BENGAL.

YEAR OF ESTABLISHMENT: 1947

NAME OF THE DIRECTOR: Dr. V. S. Jhingran

AIMS AND FUNCTIONS:

To study and elucidate the scientific principles which can be applied in the utilisation of all available inland waters for the maximum possible production of fish for food in the country. (This entails evolving suitable fish cultural techniques, investigations on the biology of important food fishes, studies on hydrology and ecology of different types of fishery waters, research on the fish populations in natural waters like rivers, lakes, estuaries etc. and fisheries management problems concerning both fresh and brackishwater fisheries).

STAFF:

Scientists and Technologist.	170
Auxiliary Technical.	4
Administrative .	150
Total,	324

MAIN DIVISIONS:

- (a) Pond Culture
- (b) Riverine
- (c) Lacustrine
- (d) Estuarine
- (e) Ancillary Schemes

MAIN ACHIEVEMENTS:

1. The problem of transport of carp seed with negligible rate of mortality has been solved by evolving oxygen packing in polythene containers.
2. Techniques to induce the Indian major carps to breed in confined waters have been evolved to produce quality fish seed on a commercial.
2. A number of exotic fishes have been introduced after experimentation to utilize the available food niches which has resulted in increased fish production.
4. Methods to control menacing aquatic weeds in fishery waters have been evolved.
5. A large number of fish seed collection centres have been established as a result of detailed spawn prospecting investigations.
6. Centres for the collection of fish seed of brackishwater species have been located.
7. Investigations on the hydrobiology and fisheries of Tungabhadra reservoir have been completed and suggestions for its development made.

8. Prophylactic and control measures to reduce incidence and spread of fish diseases in fish ponds and trout hatcheries have been evolved.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Institute has a well-equipped library, ~~as also~~ necessary laboratory facilities with running water, compressed air connections, fresh and brackishwater fish farms, air conditioned laboratory for fish breeding work, a fresh water aquarium, motor boats and vehicles at different centres, a launch in the Hooghly estuary, a Dan Boat in Ganga river system, photography and projection equipments and sufficient field equipments like tents, camp furniture, instruments used in field work, etc.

PUBLICATIONS:

- | | |
|---|--|
| (i) Bibliography of Indian Fisheries: | In English |
| an abstracting Journal. | |
| (ii) Bulletins of the C.I.F.R.I. | In English |
| (iii) Survey Reports
and | |
| (iv) Miscellaneous contributions of
the C.I.F.R.I. | In English |
| (v) Indian Journal of Fisheries | (Jointly with
C.M.F.R.I. &
C.I.F.T.,
In English) |

PLACE IN COUNTRY'S DEVELOPMENT:

The Central Inland Fisheries Research Institute is the premier research organisation tackling a large number of problems related to the development of inland fisheries in the country. It maintains a close liaison with various State Fishery Departments as well as the Universities. The results of the investigations conducted by the Institute have immense applied value, and if, they are properly integrated with effective development programmes in all the States, it will not only results in a substantial increase in food production, but will also provide suitable employment to a large number of persons and enhance the economic condition of the people who are at present employed in the industry.

20. NAME OF THE INSTITUTION CENTRAL MARINE FISHERY RESEARCH INSTITUTE
MANDAPAM CAMP, DISTT. RAMANATHPURAM, MADRAS.

YEAR OF ESTABLISHMENT: 1947

NAME OF THE DIRECTOR: Dr. S. Jones

AIMS AND FUNCTIONS:

The Institute has as its objectives the estimation and conservation of marine fishery resources of the country. For this detailed information is being gathered on the distribution, abundance, habits and life-histories, age and migrations of the economically important fishes, shrimps and shell-fishes, shrimps and shell-fishes of our waters. Information on these aspects are necessary for obtaining the maximum sustainable yield, at the same time conserving the stocks.

The scientific work of the Institute initially covered four disciplines of fisheries research, namely fishery biology, marine biology and oceanography, fishery survey and fishery technology, as an integrated programme of the Institute. The technological wing of the Institute was subsequently separated and merged with the Central Institute of Fisheries Technology, Ernakulam, when the latter was established in 1958.

The Institute which has its Headquarters at Mandapam, has also 5 substations, 9 research Units and 27 Research/Survey/Field centres carrying out scientific research on marine fisheries as directed and coordinated from the Headquarters.

STAFF:

Scientists and Technologists.	154
Auxiliary Technical Staff.	120
Administrative Staff.	50
Total	324

MAIN DIVISIONS:

1. Fishery Biology.
2. Marine Biology.
3. Oceanography and Fishery Survey.

MAIN ACHIEVEMENTS:

1. Country-wide survey of fish landings and assessment of catch and effort, compilation and analysis of exhaustive data on distribution, abundance, habits and life history, food, rate of growth, age and migration of economically important fishes, shrimps and shell fishes of our waters, together with studies on marine biological and oceanographic factors to understand the relationship between these environmental factors and the fisheries.
2. The Fishery Biology Division has, over the years, collected much valuable data on the biology of most of the commercially important fishes like the oil sardine, mackerel, tunas and bill-fishes, flat-fishes etc., crustaceans like prawns and lobsters and molluscs like oysters, mussels and squids. Exploratory offshore fishing programmes and the charting of trawling grounds, in the Bombay - Saurashtra waters and elsewhere, as also analysis of the offshore landings at all major stations formed part of this work.
3. In the Marine Biology and Oceanography Division the Institute has made extensive studies on the standing crop of the plankton (which is an important link in the food chain in the sea) and the factors that influence its fluctuations; on the extent of primary production along the continental shelf for estimating the fishing potential that could be sustained; as also on the hydrographical features particularly of offshore waters.
4. A systematic study of our richer and more productive waters on the west coast was started by the Institute a decade ago, and the work has been going on uninterrupted since then.
5. The scientists of the Institute have sampled and made observations from about 3500 stations in over 100 cruises, gathering hitherto unknown data on currents, upwellings, changes in temperature, salinity, oxygen and nutrient salt contents, planktonic organisms and pelagic and bathy-pelagic fishes. The study of the stratification of sea water, with reference to these values, from surface to a depth of over 2000 metres, has been a significant part of this programme.

6. The Institute has initiated the studies on primary production in our coastal waters, both on the east and west coast and the results have shown areas of high production on the west coast comparable with some of the most productive regions of the world.
7. A survey, on a country-wide scale, to obtain monthly and annual estimates of total marine fish landed, together with their group-wise composition for each maritime State, estimates of fishing effort and return per unit effort, compilations of census figures on the number of fishing villages, fishing population and craft and gear on the basis of complete enumeration these have been major achievements in Fishery Survey division's work. The Institute has been the only source of supply of these basic figures to various organisations and industries. The sample survey scheme, evolved by this Institute, is probably the most suitable for Indian conditions, where fishes are landed at innumerable places at almost all hours of night and day.
8. The Institute has taken part in research activities outside its own (such as participation in the International Indian Ocean Expedition) and collaborated in scientific matters with various international and national bodies like the F.A.O. of the U.N., Indo-Pacific Fisheries Council, Atomic Energy Establishment, etc.
9. The Institute has also been providing laboratory facilities to many foreign scientists who included Research Fellows from Germany (under Indo-German Industrial co-operations Scheme), scientists from the United States under the U.S. Programme in Biology in the International Indian Ocean Expedition, University Professors and teachers under the University Grants Commission Project for training of teachers in research.
10. The Institute has been recognised by the Inter-University Board of India as a centre for carrying out research leading to Ph.D. and D.Sc. degrees.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The essential laboratory facilities and equipment needed for fishery biological work are available with this Institute, whereas for the associated work on marine biology and oceanography more equipment (in the nature of sampling

equipments, current meters etc.) would be desirable. The Institute headquarters has an excellent reference collection and Museum and a library that is perhaps the best of its kind relating to fisheries and aquatic sciences in South East Asia, though its full utilization is to some extent curtailed by inadequate staff and insufficient room. There is a fairly well-equipped Photography section at the headquarters which (in association into library) needs complete copying and documentation equipment. An aquarium with running sea water is another facility available at the headquarters, which is necessary for physiological work, experimental tagging and such other work that requires marine animals to be kept alive and studied.

Such a positive picture of availability of equipment cannot, however, be maintained when it comes to the question of facilities for collection and field work. For an Institute that is meant for research on marine fisheries, the prime requirement is for sea going vessels. This basic need is but partially met by the availability of the Indo-Norwegian research vessel VARUNA and smaller powered fishing craft covering the inshore waters. The trawlers of the Deep Sea Fishing Station as well as commercial fishing companies are also made use of by the Institute for collection of data regarding fishery in offshore waters.

All these, however, are at best but partial fulfilment the objectives of work planned, and a full implementation of the Institute's programmes would need more fishery-cum-research vessels operating from the east and west coasts.

PUBLICATIONS:

The Institute is publishing, on behalf of the Government of India, Ministry of Food, Agriculture, Community Development and Co-operation, the INDIAN JOURNAL OF FISHERIES (in English) since 1954, the Director of the Institute being its Managing Editor. The headquarters of the Marine Biological Association of India is also located here, the staff of the Institute having had a prominent part in the formation of the Association and its subsequent growth. The Association is publishing its own Journal the JOURNAL OF THE MARINE BIOLOGICAL ASSOCIATION of INDIA (also in English). The Institute is also issuing a quarterly "Advance Abstracts of Contributions on Fisheries and Aquatic Sciences in India" (Also in English) from January 1967.

PLACE IN COUNTRY'S DEVELOPMENT:

Basic to any plans of the country's development are the assessment of potential resources, and the Institute's

main objective is the assessment of our marine resources and exploitation of these at the optimum sustainable level. Though the fishing industry is one of the oldest in India, the exploitation is still largely confined to the traditional narrow belt of inshore waters. The Institute has not only estimated the present catches from these waters and indicated the greater potentiality that could be tapped, but has also explored the fishing grounds further offshore marking out more profitable trowing grounds and indicating the immense possibilities of oceanic fisheries.

The development of these marine resources is of importance not merely from the point of view of food, but also as valuable foreign exchange earner.

21. NAME OF THE INSTITUTION CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY
ERNAKULAM

NAME OF THE DIRECTOR: Dr. A.N. Bose

AIMS AND FUNCTIONS:

1. The scientific exploitation of the fishery resources for meeting the acute shortage of protein foods in India for raising the socio-economic status of the fishermen numbering about a million.
2. Research and development in crafts and gear suitable under local conditions.
3. Storage, transport and preservation of the landed fish.
4. Studies on the causes of spoilage of fish, effect of different treatments on the nutritive value and consumer acceptance of the product, development of better processes and techniques for preservation, utilisation of by-product of processing industries, etc.
5. The earnings of foreign exchange through export of preserved and frozen fish and fish products co-ordinated research in various aspects of fishery technology, for the overall development of fishery industry in India.

STAFF:

Scientists and Technologists.	116
Auxiliary Technical Staff.	160
Administrative Staff.	33
Total	309

MAIN DIVISIONS:

1. Craft and Gearing Wing consists of gear branch and craft branch.
2. Processing Wing consists of chemistry, bacteriology and microbiology processing and engineering, fishing, by-products, quality control and inspection branch.
3. Extension Wing.

MAIN ACHIEVEMENTS:

1. Establishment of criteria for specifying minimum scantling for wooden fishing vessels.
2. Development of a method for specifying minimum stability of fishing vessels in the size range (32ft) to (60ft).
3. Development of mechanical method for deweeding of Lakes.
4. Improvement of setnet, bag net and traps used for inland waters.
5. Bacteriological investigations on fish, shell fish and processed fishery products.
6. Study of freezing characteristics of tropical fish.
7. Research on technological aspects of canning of fishery products.
8. Research on methods and machinery for the mechanical dehydration of fish and shell fish.

9. Researches on utilization of factory wastes and fishery by products and preparation of fish concentrates from trash fish.
10. Study of improvements in the methods of handling, processing and preservation on major types of commercial fish landed along the Saurashtra coast.
11. Determination of freezing and cold storage characteristics of commercially important fisher landed along the Maharashtra coast.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Institute has a well equipped chemical and technological laboratory. Most of the equipment essentially required for the studies etc., are available.

PUBLICATIONS:

The Institute in collaboration with the Central Marine Fisheries Research Institute, Mandapam Camp; a sister institution, publishes a quarterly journal named "Indian Journal of Fisheries". Besides this the Institute also issues a quarterly "News letter" bringing out in simple non-scientific language the important findings obtained by this Institute that are considered important in the context of the efforts made for the development of the fishing and fish processing industry. The above publications are in English.

PLACE IN COUNTRY'S DEVELOPMENT:

The studies and investigations undertaken at this Institute has a direct bearing on the Fisheries Development Programme of the Government.

22. NAME OF THE INSTITUTION TECHNOLOGICAL RESEARCH LABORATORY (COTTON)
(MATUNGA, BOMBAY)

YEAR OF ESTABLISHMENTS: 1924

NAME OF THE DIRECTOR: Dr. V. Sundaram

AIMS AND FUNCTIONS:

1. To obviate the difficulties experienced by the cotton breeders in India in regard to getting reliable estimation of the quality of new cottons by providing them with authoritative data on the spinning and fibre characteristics of different strains of cotton evolved by them from time to time and thus, to place cotton breeding work on a sure and stable foundation.
2. To test cotton samples of fair average quality belonging to the representative trade varieties in each season.

STAFF:

Scientists and Technologists.	42
Auxiliary Technical.	61
Administrative.	40
Total.	143

MAIN DIVISIONS:

1. Spinning.
2. Fiber Testing.
3. Ginning and Yarn Testing.
4. Microscopy and Microbiology.

MAIN ACHIEVEMENTS:

1. Studies in the mixing of Indian Cottons with special reference to their fibre properties.
2. Formation of neps in ginning.
3. Determination of bulk torsional rigidity of cotton fibres.
4. Oil and linter contents in Indian cotton seeds.
5. Method of sample preparation and its effect on micronaire fineness and maturity.
6. Relationship between fibre and spinning value of cottons of staple 1.1/16" and above.
7. Variation of fibre-maturity from single seeds in relation to seed and embryo weights.
8. Effect of conditions of growth on the strength and structure of cotton fibres: preliminary results on the effect of locality of growth.
9. A comparative study of the visual assessment of yarn irregularity with the Uster Evenness Tester.
10. Upgrading of good quality Indian cottons by the use of double roving on double apron drafting system and its relation to their fiber properties.
11. Effect of different processing treatments on the spinning quality of M.A. 5 cotton.
12. Contribution to the study of B-L curve of cotton yarns.
13. A note on the determination of cotton fibre - maturity using the cotton grader.
14. Variation in the yarn quality at different portions of the bobbin.
15. Non-lint content measurement by the one - Pass Shirley Analyser procedure.
16. Estimation of floating fibre percentage using the Digital Fibrograph.
17. Comparative performance of three interspecific varieties of cotton.
18. Evaluation of the eight parameter with Digital Fibrograph with reference to fibre-length uniformity.

PUBLICATIONS:

1. Technological Bulletins.
2. Technological leaflets.
3. Articles and Papers.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory is doing research mainly on structural, developmental and agronomic aspects of the fibre.

• (28-30). NAME OF THE INSTITUTIONS SOIL CONSERVATION RESEARCH, DEMONSTRATION AND TRAINING CENTRES.

AIMS AND FUNCTIONS:

1. To carry-out research on the soil conservation problems of the region covered by the Centre, by collecting and analysing data on soils, landuse, rainfall, runoff, soil wash under different conditions and effectiveness of various types of vegetative cover in arresting soil erosion.
2. To evolve methods for control of erosion, reclamation of torrents, and establishment of landslides and debris mounds.
3. To evolve soil conservation practices suitable to the region and their demonstration to the cultivators in neighbouring areas.
4. To impart training in soil and water conservation to the officers sponsored by the State Governments.

<u>LOCATION</u>	<u>YEAR OF ESTABLISHMENT</u>	<u>NAME OF THE HEAD OF THE CENTRE</u>	<u>STAFF IN THE CENTRE</u>	<u>MAIN DIVISIONS IN THE CENTRE</u>
(i) Dehradun (U.P)	1954	Dr.K.G.Tejwani	Scientists 13 Technical 3 Auxiliary 9 Administrative. 11	Engineering Forestry Laboratory
(ii) Kotah (Rajasthan)	1954	Sri Rajbans Dayal	Scientists 7 Technical 7 Administrative 4	Soils Agronomy Forestry Engineering
(iii) Ootacamund (Madras)	1955	Shri P.K.Thomas	Scientists 7 Technical 16 Administrative. 6	Engineering Forestry Agronomy Soil Science
(iv) Bellary (Mysore)	1954	Shri A.R.Bhas- karan	Scientists 5 Technical 11 Administrative. 6	Soil Science. Agronomy Forestry Plant Physiology Engineering & Hydrology.

(v) Vasad (Gujarat)	1955	Shri Balvir Verma	Scientists 17 Technical 16 Administra- 6 tive.	Soils Agronomy Forestry Engineering
(vi) Chandigarh	1956	Shri I.I.Erasmns	Scientists 4 Technical 5 Administra- 3 tive.	No separate divisions
(vii) Agra (U.P)	1955	Shri H.M.Gidwani	Scientists.3 Technical 7 Administra- 3 tive.	Engineering Forestry Agronomy & Soil
(viii) Hyderabad (A.P.)	1962	Shri J.V.Thakur	Scientists. 3 Technical 14 Technical 14	Agronomy Engineering Laboratory Forestry & Soils.

MAIN ACHIEVEMENTS:

These Centres have carried out soil and land use survey of the regions covered by them. They have completed a number of studies on moisture contents of the soil in the region, soil and water losses under various cropping systems, vegetative and mechanical methods to check soil erosion, development of canopy for protecting lands from soil erosion, etc. These Centres have also prepared soil conservation plans for specific areas as and when requests to this effect were made by State Governments. Some of the centres have also made studies on water logging, drainage planning and ravine reclamation.

PUBLICATIONS:

Some of the publications of these Centres are detailed below.

- (i) Soil & Water Conservation in the Chambal Tract (Hindi and English)
- (ii) Soil and Water Conservation in the watershed.
- (iii) Proceedings of the first Regional Co-ordination Committee Meeting of Ravine Regions.
- (iv) Dry Teak Forests of Hyderabad.
- (v) Annual and Quarterly Reports of the Centre.

V. MINISTRY OF HEALTH, FAMILY PLANNING
AND URBAN DEVELOPMENT

The Ministry of Health, Family Planning and Urban Development is responsible, among others,

for the promotion of medical research regulation and development of medical, pharmaceutical, dental and nursing professions, in consultation with the State Governments and the statutory councils concerned, and laying down the standards of education for these professions;

establishment and maintenance of drugs standards in consultation with the state Governments, and prevention of adulteration of food; and

propagation of various medical and health schemes.

The office of the Director-General Health Services functions as the chief executive organisation for the Ministry in the entire medical and public health field.

The Indian Council of Medical Research, which is under the administrative control of the Ministry of Health, Family Planning and Urban Development is responsible for development work in the field of medical research and for formulation of programmes of research into urgent problems in the fields of medicine and public health.

Research work in the areas of responsibility of the Ministry is carried out in 7 research organisations, under the Directorate-General of Health Services and 6.... laboratories under the Indian Council of Medical Research. A brief description of these organisations is given in the following pages.

(A) Institutions under the Directorate-General of Health Services.

1. NAME OF THE INSTITUTION CENTRAL FOOD LABORATORY,
CALCUTTA-16.

YEAR OF ESTABLISHMENT: 1955

NAME OF THE DIRECTOR: Shri S.N. Mitra,

AIMS AND FUNCTIONS:

The Central Food Laboratory is a statutory laboratory created under the Prevention of Food Adulteration Act 1954. Its duties are:-

- (a) Analysis of samples of food sent by any officer or authority authorised by the Central Government for the purpose and submission of the certificate of analysis to the authorities concerned.
- (b) Investigation for the purpose of fixation of standards of any article of food, and
- (c) Investigation in collaboration with the laboratories of Public Analysts in the various States for the purpose of standardising methods of analysis. Further, it acts as the reference laboratory to the Government of India in technical and scientific matters relating to foods and foodadjuncts.

STAFF:

Scientists and Technologists.	27
Auxiliary Technical Staff.	13
Administrative Staff.	25
Total.	65

MAIN DIVISIONS:

The work of the laboratory is divided at present into three main sections, (1) Appeal (Court) Section (2) Pesticide Section and (3) Research and Standardisation Section. More sections, e.g. (a) Toxicological Section (b) Micro-biological Section, (c) Nutrition Section, (d) Information and Public Relation Section, and (e) Training Section, are contemplated for future expansion.

MAIN ACHIEVEMENTS:

1. The Laboratory has been analysing appeal samples of foodstuffs from the trying Magistrates from all over the country sent under the Prevention of Food Adulteration (P.F.A) Act.
2. Appeal analyses of samples of foodstuffs imported by land and sea are also being done.
3. Caters to the different analytical needs of various Government Departments, both Central and States, and gives advice when needed.
4. Specific additives or adulterants have to be found out.
5. It has already published nearly one hundred scientific papers on new findings in analytical chemistry, food analysis, additives and residue analysis and standardization.
6. The Laboratory did pioneering work on the chromatographic separation and detection of food colours and antioxidants in different foodstuffs.
7. It worked out a method for estimation of the pesticide (parathion) residue in foodstuffs.
8. The detection of mustard oil used as an adulterant.
9. Detection of hydrocyanic acid in oils.
10. Detection of Kesari dal (Lathyrus sativus) and its powder.
11. Detection of technical invert sugar in honey, opium in tea.
12. Estimation of colophony resin in Hing (asafoetida), etc.
13. Work has also been carried out on methods of analysis.
14. Work is done on analytical variations of tea, purity standards of Hing (asafoetida) and honey and legal standards of cardamom, coffee, French coffee, carbonated beverages and different sweets.
15. The Laboratory has standardized methods of detection and estimation of different pesticides in foodstuffs.

16. Some work also has been done by animal experimentation on toxicity and for finding the suitability or otherwise of a foodstuff for human consumption.
17. The Laboratory has already done some preliminary work on the examination of solvent residue in solvent-extracted oils and oil-cakes.
18. Establishing a food testing Laboratory in Kabul, Afghanistan.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Laboratory is well-planned, spacious and well-equipped. Basic and specialised apparatus and instruments have also been commissioned, such as, Butyro refractometer, Immersion refractometer, polarograph, spectrophotometer, pH-meter, photo-electric colorimeter, etc. Research facilities exist for almost all types of problems in food science.

PUBLICATIONS:

The Laboratory has published nearly 100 research papers already. A few others are in preparation. All the papers published are in English.

2. NAME OF THE INSTITUTION CENTRAL LEPROSY TEACHING AND RESEARCH INSTITUTE, CHINGLEPUT, MADRAS.

YEAR OF ESTABLISHMENT: 1955

NAME OF THE DIRECTOR: Dr. C.G.S. Iyer,

AIMS AND FUNCTIONS:

1. To undertake research into the basic problems relating to inception and spread of leprosy.
2. To promote field studies for the application of the results of basic researches to the problems of controlling leprosy in the community.
3. To train leprosy workers of various types in sufficient numbers of the requisite quality.
4. To function as a centre from which to give technical advice and guidance for the promotion of anti-leprosy work on sound lines.

5. To participate actively in the organisation and development of State Leprosy Institutions when such are established and to make available its services for the investigation of special problems in all parts of the country.

STAFF:

Scientific staff.	23
Auxiliary Technical Staff.	77
Administrative and Ministerial Staff.	27
Others.	112
Total.	239

MAIN DIVISIONS:

1. The Clinical Division, which includes the Sanatorium, the attached Hospital, and the Surgical Section.
2. The Division of Laboratories.
3. The Division of Epidemiology and Statistics.

The Sanatorium has accommodation for a little over 900 patients inclusive of men, women and children, most of whom are treated on an ambulant basis. Regular hospital accommodation for those who are acutely ill with complications of leprosy and intercurrent illnesses requiring hospitalisation, and surgical attention, consists of about 200 beds spread over 8 wards inclusive of one for patients who have pulmonary tuberculosis in addition to leprosy. The Institute has out-patient facilities on all working days during the week.

According to the original constitution of the Institute, each of the Divisions is headed by an officer designated as the Head of the Division; the Director of the Institute holds charge of one of the Divisions in addition to his own duties. Other officers work under the various Heads of Divisions and look after individual sections and departments of these Divisions. Besides the intramural programmes, which include care and treatment of patients of leprosy in the Sanatorium, the Institute has a large extra-mural programme covering an area of approximately 200 sq. miles around the Institute in Chingleput District.

MAIN ACHIEVEMENTS:

Service to leprosy patients includes diagnosis, medical therapy, surgery, physiotherapy, and rehabilitative and educative activities. Researches are being carried out on the therapeutic trials with various drugs. The Surgical Section is active in devising new operations for disabilities suffered by leprosy patients and the results of many of these are under investigation.

Researches in the Laboratories include detailed investigations on the pathology of various types of leprosy lesions, with particular reference to changes in nerves, biochemical alternations in blood and body fluids in various phases and types of leprosy, metabolic investigations on the isolated leprosy organisms, attempts at culture and at experimental transmission, and bacteriological and serological work in various types of leprosy. The Clinical Pathology Laboratory attached to the Laboratories Division renders routine service to the patients of this Institution.

The Division of Epidemiology has as its main activity the supervision and execution of a DDS Prophylaxis Programme whose main object is to ascertain whether small doses of the drug currently used for treatment of leprosy will, if administered prophylactically to contacts of leprosy patients, either prevent or delay the onset of leprosy in such contacts. Miscellaneous studies like the investigation of special features in leprosy in isolated communities, the role of genetic factors in the determination and causation of leprosy, and other miscellaneous field investigations are also being undertaken.

The Institute has a comprehensive and varied training programme as part of its activities. Trainees under these programmes include, personnel both from this country as well as from other countries including Africa, South East Asia and other parts of the world, who are referred by international agencies like WHO, or foreign governments.

The training programmes currently being undertaken at this Institute includes:

1. Six months course for Paramedical Workers.
2. Ten months course for Physiotherapy Technicians.
3. Ten months course for Laboratory Technicians.
4. Four weeks course for Health & Sanitary Inspectors.
5. Six weeks course for Medical Officers.
6. Six months course for Medical Officer in Reconstructive Surgery
7. Two weeks course for Medical Officers in Physiotherapy, and
8. Other short and long-term courses to meet the needs of specific request.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Institute is well equipped both in respect of staff, and laboratory and other facilities for conducting the various investigations that it undertakes. Support for these is obtained from the Government of India, and from various international agencies like WHO, UNICEF, etc. The Institute has a fairly well-stocked library sufficient for its needs.

PUBLICATIONS:

A number of scientific and research papers have been published from the Institute in English, and have appeared in either Indian or foreign medical periodicals. (Total number of publications from the year 1961 to 1966 is 60).

The Institute publishes a quarterly bulletin in English entitled 'CLTRI News Bulletin' which contains reports of activities of the various departments of the Institute, as well as matters of general interest in leprosy.

Special publications from this Institute include two pamphlets entitled "Some Facts About Leprosy" and "Care of Hands and Feet of Leprosy Patients". Both these are available for sale from the Central Health Education Bureau, Kotla Road, Temple Lane, New Delhi.

PLACE IN COUNTRY'S DEVELOPMENT:

This Institute deals with an important public health problem, and as indicated earlier, the objectives for which it was established would indicate its importance in the country's development.

3. NAME OF THE CENTRAL DRUGS LABORATORY,
INSTITUTION CALCUTTA-16.

YEAR OF ESTABLISHMENT: 1937

NAME OF THE DIRECTOR: Dr. D. Ghosh,

AIMS AND FUNCTIONS:

The Central Drugs Laboratory is a statutory laboratory with defined functions under the Drugs Act. The aims of the organisation is to help the Government to prevent import, manufacture and sale of sub-standard drugs and in their effort to prevent the trade in spurious drugs. Besides, it

helps the manufacturers and allied institutions in their problems of drug standardization by giving advice, training workers deputed to this laboratory and supplying authentic samples and Standards in this connection. The main functions are enumerated.

- (a) Testing and analysis of samples of drugs received from Customs authorities and Courts of Law. In case of a dispute this Laboratory acts as an appellate body.
- (b) Testing and analysis of samples of drugs received from the State Governments. This is an additional function carried out on behalf of the States who are not yet ready with well equipped laboratories and trained analysts to take up this function.
- (c) Acting as a Control Laboratory for maintenance and distribution of International Standards as well as for establishment of National Reference Standards.
- (d) Assisting commercial firms and institutions by training their workers, giving advice on problems of drug standardisation and supplying authentic samples and standards maintained in this laboratory.
- (e) Carrying out research investigation particularly on problems of standardisation and storage of drugs.
- (f) Maintenance and supply of standard bacterial strains to Laboratories needing such strains.

STAFF:

Scientists and Technologists.	38
Auxiliary Technical staff.	29
Ministerial Staff.	15
Class IV Staff.	43
Total.	125

MAIN DIVISIONS:

- 1. Pharmaceutical Chemistry.
- 2. Biochemistry.
- 3. Pharmacology.
- 4. Bacteriology.
- 5. Pharmacognosy.

MAIN ACHIEVEMENTS:

The nucleus of this Laboratory, then known as the Bio-chemical Standardization Laboratory was established in the year 1937. As Statutory Laboratory under the Drugs Act, this Laboratory, re-designated as Central Drugs Laboratory, is functioning since 1947. During the progress of this laboratory it has been possible to prevent import, manufacture and sale of sub-standard drugs to a large extent. Before drug control, the market used to be flooded with sub standard (or of no standard) drugs both foreign and indigenous. This condition has changed considerably to a better since strict enforcement of drugs control on the basis of reports issued by this laboratory, which is the only laboratory of its kind in this country.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

As already stated, this is not a research institution perse. However, as a testing laboratory it has many problems of its own. These problems of drug standardisation have to be solved in order to fulfil its obligations as a testing and appellate laboratory. As a result, many problems on drug standardisation are taken up during routine analytical work. For this work, adequate facilities regarding equipments exist in this laboratory. The main difficulty, however, is that the Analysts are so much occupied with routine work that they hardly get enough time to take up other problems.

PUBLICATIONS:

Many research papers are being published in scientific journals from this laboratory in English language.

PLACE IN COUNTRY'S DEVELOPMENT:

This Laboratory is helping in the development of the country in a very useful way. Drugs which are essential for the prevention and treatment of diseased conditions of people, must reach the consumers in pure form, so that the desired therapeutic effect is produced. This laboratory by checking the quality of drugs marketed, serves a very essential purpose in maintaining health of the people of the country and thus occupies an important place in country's development.

4. NAME OF THE INSTITUTION ALL INDIA INSTITUTE OF HYGIENE AND PUBLIC HEALTH,
CALCUTTA-12.

* YEAR OF ESTABLISHMENT: 1932

NAME OF THE DIRECTOR: Dr. Muktha Sen

AIMS AND FUNCTIONS:

The Institute aims at the provision in India of a first class centre for advanced upto date instruction in the methods of preventive and social medicine suited to combat India's peculiar, varied and numerous illnesses and diseases and for research directed towards ascertaining the best ways of utilising the results of pure and applied research in all associated fields for the requirement of medical protection and positive health of large units of population both rural and urban.

MAIN DIVISIONS:

The Institute has nine sections each of which is under charge of a Professor, who is assisted by his Associate and Assistant Professors and other technical staff. Names of sections are given below:

- i. Public Health Administration.
- ii. Epidemiology.
- iii. Biochemistry and Nutrition.
- iv. Maternity and Child Welfare.
- v. Microbiology.
- vi. Sanitary Engineering.
- vii. Statistics.
- viii. Physiological and Industrial Hygiene.
- ix. Health Education.

MAIN ACHIEVEMENTS:

With the establishment of the Institute, the long felt need of providing fullfledged facilities for professional education in public health has been fulfilled. From a start of 24 students, 400 are now on average, being trained per annum, through the numerous courses of studies, of which special mention may be made as follows:

- 1). DPH, DPH & Hy, Dm & CW, M.E. (P.H.), Dip.Diet, DIH, D.N., D.H.E. and family Planning, etc.
In the field of research, Institute activities, cover a wide area giving shape to new concepts and to the development of suitable methodology for tackling community health problems baffling

MAIN RESEARCH FACILITIES AND EQUIPMENT:

Facilities at the Institute include well equipped laboratory under charge of the Sectional Professors and an up-to-date library, a museum and an urban and a rural practice fields. Facilities are also available at the Institute for a limited number of special students to carry out research in any one of the public health disciplines, subject to the approval of the DGHS, New Delhi. Such work can be utilised for preparation of a thesis for a doctoral degree of the Calcutta University. Under the auspices of the Indian Council of Medical Research studies on public health subject are undertaken annually in the Institute. Guidance for such research studies are usually given by the Professors themselves.

PUBLICATIONS:

Publications concerned with Communicable Diseases, Environmental Sanitation, Maternal and Child Health, Occupational Health and Public Health Practices, have been published by the Institute.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has participated in shaping the policies and programmes at the national level. The Institute's Director, as a member of the Health Survey and Development Committee has made valuable recommendations regarding the training of the public health personnel. The Institute again had a prominent part to play in the Environmental Hygiene Committee set up by the Ministry of Health. In recent years the Institute's advice has been sought in formulating the public health programmes of the successive five year Plans. Health education, preventive and social medicine and family planning are some of the recent specialisations in the health field where the Institute has given its experience and advice. The Institute in training, research and service in the public health field continues to be premier Institute of its kind in the country.

5. NAME OF THE INSTITUTION CENTRAL RESEARCH INSTITUTE
KASALI

NAME OF THE DIRECTOR: Dr. A.K. Thomas

AIMS AND FUNCTIONS:

1. Research, both basic and applied of medical and public health importance.
2. Manufacture of T.A.B., Cholera and Antirabic Vaccines, Diphtheria Antitoxin, Tetanus Antitoxin, Tetanus Toxoid, Antivenom Serum and Antirabic Serum, Triple Vaccine; Yellow Fever Vaccine, etc.
3. The Institute serves as the Government of India's Central Drug Laboratory in respect of all biological products, imported or manufactured in the country, in accordance with the provisions of the Drugs Act, 1940.
4. The Institute serves as a Centre for the collection and distribution of bacterial type cultures and international Standards of toxins and antitoxins.
5. Laboratory diagnosis work in histology, bacteriology and biochemistry for both the Government and non-government institutions.
6. National Centres for Salmonella and Escherichia group of organisms and for Influenza are located at the Institute.
7. The Field Unit of the Institute carries out laboratory investigations and studies in the epidemiology of different bacterial and viral communicable diseases occurring in north-western regions of the country.
8. Provision of training ^{to} laboratory personnel in technique for bacteriology, virology, immunology and biochemistry and for medical and veterinary personnel in diagnosis, prevention and treatment of rabies. The Institute conducts regular courses for B.Sc. (Hons.) School and M.Sc. degrees of the Punjab University in the subject of Microbiology and also imparts training for post-graduate studies in pathology, bacteriology and biochemistry for which it has been recognised by several Universities.

9. The Institute provides expert advice on questions concerning rabies, snake bite, cholera, typhoid and other communicable diseases to individuals and to the Government of India, Indian Council of Medical Research and Indian Pharmacopoeia Committee.

STAFF:

Scientists & Technologists.	29
Auxiliary Technical.	52
Administrative.	55
Total	136

MAIN DIVISIONS:

1. Bacterial Vaccine Section (Includes Kitchen, Media, Bottling and Ampouling Sections)
2. Biochemistry Section.
3. Biological Standardisation and Quality Control Section.
4. Serum Concentration Section.
5. Triple Vaccine Section.
6. Virus Section.
7. Yellow Fever Vaccine Section.

In addition to these six major Technical Sections, there are the following 10 other Sections each under the charge of a qualified and experienced member of the staff:-

- i) Accounts and Cost Accounts Section.
- ii) Clinical Pathology and Bacteriology.
- iii) Administration Section (General & Office)
- iv) Field Unit.
- v) Libraries (Central Research Institute and Indian Council of Medical Research).

- vi) Maintenance and Engineering Workshop.
- vii) Microfilm Unit (I.C.M.R.).
- viii) National Salmonella and Escherichiae Centre.
- ix) Stables and Animal House.
- x) Stores.

MAIN ACHIEVEMENTS:

1. A serum for the treatment of snake bites.
2. A vaccine for the prevention of typhoid fever.
3. Preparation of the vaccine for enteric fever and dysentery.
4. Setting up of laboratories for bacteriological classes and the Malaria Bureau.
5. The Institute functions as a diagnostic laboratory for infectious diseases in the country.
6. Associated with researches in the field of parasitology and a large volume of useful information has been collected on malaria, Kala-azar and relapsing fever.
7. Great deal of work has been done on typhus infection in India.
8. Training of personnel for the diagnosis, prevention and treatment of rabies. A training course is held every year for a period of three weeks and facilities exist to train 20 medical practitioners.
9. Manufacture of Diphtheria, Tetanus and Pertussis vaccines with the collaboration of World Health Organisation and the UNICEF.
10. Manufacture of Yellow Fever Vaccine.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The facilities for carrying out research relating to the manufacture of biological products for human use and medical and public health problems are available.

PUBLICATIONS:

Annual Report of the Institute giving brief details of the work carried out at the Institute is published in English.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute has a pivotal role to play in solving the medical and public health problems of the country. It supplies Vaccines and Sera, like Cholera, T.A.B., A.R.V., Triple Vaccines and Antivenom Serum etc., to the various States, Civil Dispensaries throughout India and Army. Some of the products are also exported. The Institute also serves as a Centre of training in the field of microbiology, Bacteriology and Virology.

6. NAME OF THE INSTITUTION CENTRAL INDIAN PHARMACOPOEIA LABORATORY
GHAZIABAD

NAME OF THE DIRECTOR: Dr. J.N. Teyal

AIMS AND FUNCTIONS:

1. Revising the Indian Pharmacopoeial Standards in respect of the drugs incorporated therein by experimentation on authentic samples of drugs prepared according to the stipulations given in the pharmacopoeias.
2. Serving as a Government Analyst Laboratory for the Union Territories and the neighbouring States. These facilities will be placed at the disposal of other States for utilising the same, if they so desire.
3. Investigations on packing and storage life of different dosage forms given in I.P.
4. Providing facilities for the analysis and tests on the Ayurvedic and Homeopathic dosage forms.

5. Liason with I.S.I. and similar organisations with the object of aligning test procedures in respect of items of common interest.
6. Research on analytical methods with the object of introducing precise and reproducible test procedures in the I.P.

STAFF:

Scientists and Technologists.	1
Auxiliary Scientific/Technical Staff.	3
Administrative Staff.	4
Total.	13

MAIN DIVISIONS:

1. Pharmaceutical Chemistry.
2. Biochemistry.
3. Bacteriology..
4. Pharmacognosy.
5. Pharmacology.
6. Analytical Chemistry.
7. Technical Co-ordination, including library.
8. Physical-testing Division.
9. Services Section.

MAIN ACHIEVEMENTS:

The laboratory has been notified for recognition as Drug Analyst Laboratory for non-schedule 'C' and 'C₁' items as well as contraceptives.

Data for revising some of the Pharmacopoeial monographs have been collected.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The laboratory is equipped for chemical investigational work pertaining to drugs and drug formulations. Required facilities are in the process of augmentation.

PUBLICATIONS:

Nil, so far.

PLACE IN COUNTRY'S DEVELOPMENT:

The laboratory has important scheme of development in fourth Plan and from the current trends it can be forecast that if the present progress is maintained the laboratory will attain an important position in ensuring uniformity and genuineness of the drugs manufactured in the country by rationalisation of pharmacopoeial standards, which will be binding on all concerned. Thus it has the potentiality of reckonable national importance.

7. NAME OF THE INSTITUTION NATIONAL INSTITUTE OF COMMUNICABLE DISEASES, 22- ALIPORE ROAD, DELHI-6.

YEAR OF ESTABLISHMENT: 1909

NAME OF THE DIRECTOR: Dr. N.G.S. Raghavan, B.A., M.D.

AIMS AND FUNCTIONS:

1. To be fully informed on all the problems of communicable diseases including their incidence and distribution.
2. To initiate and undertake fundamental and applied research underlying the prevalence, spread and prevention of communicable diseases, including a study of the aetiological agents, vector arthropods, mechanism of infection-endemic and epidemic phenomena, and zoonotic reservoirs of infection.
3. To render service and advice on all aspects of communicable diseases to the Union and State Governments and other National/International Institutions/Organisations including National/International Programmes for control and eradication of these diseases.
4. To create expertise for determining/isolating/typing etc. of pathogenic agents, haematophagous arthropods and reservoir animals.
5. To undertake training of professional personnel in
 - i) epidemiology of communicable diseases;
 - ii) ecology and control of vector-borne diseases; &
 - iii) epidemiology and control of specific communicable diseases under National Programmes.

6. To train technicians and auxiliary personnel in the methodology and control of communicable diseases.
7. To create facilities for post-graduate students on different aspects of communicable diseases.

STAFF:

Scientists and Technologists.	57
Auxiliary Technical.	9
Administrative.	135
Total.	201

MAIN DIVISIONS:

National Institute of Communicable diseases is administratively a part of the Ministry of Health and Family Planning under the Director General of Health Services. The Institute has been organised into the following main divisions under the overall charge of the Director, each of the divisions listed below being incharge of Deputy Director:

1. Division of Epidemiology.
2. Division of Medical Entomology.
3. Division of Microbiology.
4. Division of Biochemistry.
5. Division of Zoonosis.
6. Division of Training/Administration.

The National Filaria Control Programme (NFCP) started in 1955 as a large scale pilot programme for studying the methods of control of filariasis in India also forms a part of the Institute under the charge of a Deputy Director.

Presently a Neuro-virulence testing unit is being established at the Institute to test the Polio Vaccine manufactured within the country. This unit will also be in-charge of a Deputy Director.

MAIN ACHIEVEMENTS:

1. The National Filaria Control Programme run by the Institute since its inception in 1955 has made steady progress during the years in delimiting the problem and developing methodology for the control of the disease.
2. Over the years the Institute has developed one of the finest collections of haematophagous arthropods which contains many typespecimens of mosquitoes and simuliids. Colonies of insects and other animals are maintained at the Institute for use in experimentation teaching.
3. The Institute has carried out systematic epidemiological including entomological investigations on the occurrence and spread of Haemorrhagic fever in different parts of the country.
4. Other notable recent investigations have been on the epidemiology of Cholera, typhoid, infections hepatitis and other microbial infections.
5. The Institute has already initiated investigations which will reveal the ecology of some of the zoonotic diseases. These include (i) determination of the landscapes favouring the biotic component of the disease; (ii) vector/potential, vector ectoparasites; (iii) mammalian reservoirs; (iv) pathways for human infections; (v) culture/isolations of aetiological agents.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

The Institute has well equipped laboratories where routine and research activities are in progress. Modern equipment are available and more are being procured. The laboratories, a good library and the liaison maintained with the other Research Institutions in India (and abroad) and the State Health Organisations offer amply facilities for research work both in the laboratory and in the field.

PUBLICATIONS:

The Institute has contributed more than 2000 scientific papers which include memoirs and guide books. Till 1964, the Institute edited the Indian Journal of Malariology published by the Indian Council of Medical Research.

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute is recognised by the Inter University Board as a centre for conducting post graduate research in the fields for which facilities exist. Consequently, post graduate degrees have been awarded by various universities for research work carried out at the Institute.

The Institute collaborates in the W.H.O. sponsored Combined Course in Epidemiology. The participants in the course are given theoretical and field training in communicable diseases especially those of the tropics, for a period of 3 months.

Since 1960 the National Institute of Communicable Diseases has trained 1,858 persons attending the various courses held at the Institute. The trainees included foreign scientific workers.

(B) RESEARCH INSTITUTIONS UNDER THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI.

The Indian Council of Medical Research was established in 1949, as a registered society. It was formed as a successor to the Indian Research Fund Association, which was founded in 1911 for the promotion of medical research in the country.

The objects for which the Council is established are:-

- (i) To take over and manage the assets of the Indian Research Fund Association (registered under the provisions of the Societies Act XXI of 1860) on its dissolution, or such part thereof as can be taken over by the Council as also to take over and manage the assets or any parts of the assets of any other organization having objects similar to those of the Council.
- (ii) The prosecution and assistance of research, the propagation of knowledge and experimental measures generally, in connection with the causation, mode of spread, and prevention of diseases primarily those of a communicable nature.
- (iii) To initiate, aid, develop and co-ordinate medical scientific research in India and to promote and assist institutions for the study of diseases, their prevention, causation and remedy.
- (iv) To finance enquiries and researches.
- (v) To exchange information with other institutions, associations and societies interested in the same objects, and specially in the observation and study of diseases in the East, and in India in particular.
- (vi) To prepare, print and publish any papers or periodicals in furtherance of the objects of the Council and to contribute to any such periodicals.

The management of the Council is entrusted to a Governing Body, which consists of nine official and eight non-official members. The Union Health Minister is the President of the Council and Secretary, Ministry of Health its Vice-President. The other official members include the Director General of Health Services, one of the Deputy Directors General of Health, the Director General of Scientific and Industrial Research, the Director General of Armed Forces Medical Services, three Director of the Medical Research Institutes (one each from the Institutes supported by Central Government, State Governments and voluntary organisations). The non-official members of the Governing Body include ~~one representative of the Rajya Sabha~~, two of the Lok Sabha, one eminent non-medical scientist to be elected by the Council of the Indian Science Congress, the Maharaja of Parlakimedi, and three representatives of the Medical faculties of the Indian Universities. The Director of the Indian Council of Medical Research is the Secretary of the Governing Body.

The current duties of the Council and such other duties as the Governing Body may assign, are looked after by an Executive Committee consisting of four members of the Governing Body, viz., the President, the Vice President, the Director-General of Health Services and the Deputy Director-General of Health Services.

The Governing Body is assisted in its task by a Scientific Advisory Board, consisting of 16 members. The Board examines all proposals in connection with the scientific objects of the Council and reports on their feasibility to the Governing Body.

/are

There six permanent research institutions under ICMR. Of these, the Central Institute of Research on Occupational Health, Ahmedabad, is in the process of establishment. In addition, the Council supports a number of research units located in various medical colleges/institutions. A brief description of the five permanent research institutions under I.C.M.R. is given in the following pages.

1. NAME OF THE INSTITUTION CHOLERA RESEARCH CENTRE,
KYD STREET, CALCUTTA-16.

YEAR OF ESTABLISHMENT: 1962

NAME OF THE DIRECTOR: Dr. D.L. Shrivastava

OBJECTIVES:

1. The existence and relative frequency of cholera carriers in a community living in an endemic area in inter-epidemic period on the eve of an epidemic and during and after an epidemic.
2. The duration of carrier state in various types of carriers.
3. The reservoir of infection and the form in which V. Cholerae survives during the inter-epidemic periods.
4. The role, if any, of the NAG vibrios, particularly those whose saccharolytic are similar to those of V. Cholerae, and of the rough vibrios occasionally isolated in convalescent carriers.
5. The effects of various methods of treatment of carriers and, if possible, patients.
6. The effect of drug addiction and different food habits on the carrier state.
7. Any other problems which may be worth investigation in the light of the results obtained.

STAFF:

Scientists.	9
Other Technical Staff.	13
Administrative Staff.	5
Total.	27

MAIN DIVISIONS:

1. Bacteriology and Immunology.
2. Immune - Chemistry.
3. Media - Section.
4. Animal Section.

MAIN ACHIEVEMENTS:

1. Controlled field trials of cholera vaccines.
2. Studies on the methods of collection of stool samples and isolation of V. Cholerae from them.
3. Haemagglutination in vibrios.
4. Haemolysis in vibrios.
5. Effect of chlorine on some of the biological characters of V. Cholerae.
6. Isolation from samples of water and flies.
7. Serological diagnosis of cholera.
8. Immunological behaviour of cellular substances of V. Cholerae.
9. Studies on the antigens of V. Cholerae.
10. Metabolic studies on the atypical strains of V. Cholerae.

2. NAME OF THE INSTITUTION NUTRITION RESEARCH LABORATORIES,
TARNAKA, HYDERABAD.

YEAR OF ESTABLISHMENT: 1918

NAME OF THE DIRECTOR: Dr. C. Gopalan

AIMS AND FUNCTIONS:

1. Carrying out researches in the laboratory hospital and in the field on several dietary and nutritional problems with a view to elucidate the factors responsible for them and to evolve appropriate methods of treatment and prevention.
2. Training young scientists in research methods in nutrition and allied subjects.
3. Training public health workers and Community Development workers in nutrition to enable them participate in Nutrition Action Programmes.
4. Advising Governments and other organisations on questions of nutrition.
5. Helping in the spread of nutritional knowledge among the general public through popular publications and other means.

STAFF:

Scientists.	38
Other Technical Staff.	24
Administrative Staff.	5
Total.	67

MAIN DIVISIONS:

1. Clinical Unit.
2. Biochemistry.
3. Analytical Chemistry.
4. Physiology.
5. Biophysics.
6. Pathology.
7. Field Unit.
8. Extension and Training.
9. Dietetics.
10. Statistics.

MAIN ACHIEVEMENTS:

1. Several epidemiological and anthropological studies and investigations on nutrition education.
2. An evaluation of the Applied Nutrition Programme in Andhra Pradesh.
3. An investigation on the extent of nutrition work and available and feasible under the existing Maternal Child Health Services.
4. An evaluation of the school lunch.
5. Annual certificate course in nutrition.
6. Annual training course in nutrition.

PLACE IN COUNTRY'S DEVELOPMENT:

Enquiries from the general public and government departments on nutritional matters are dealt with. Several small booklets and pamphlets intended for general public are quite informative and they help in the popularisation of nutritional information.

3. NAME OF THE INSTITUTION TUBERCULOSIS CHEMOTHERAPY CENTRE, CHETPUR, MADRAS-31

YEAR OF ESTABLISHMENT: 1956

NAME OF THE DIRECTOR: Dr. N.K. Menon

AIMS AND FUNCTIONS:

To conduct controlled studies designed to provide information on domiciliary chemo-therapy in the treatment of pulmonary tuberculosis.

STAFF:

Clinic	10
Laboratory	15
Statistics	8
Library	1
Administration	5
Total.	39

STUDIES UNDERTAKEN AT THE CENTRE:

1. Home and sanatorium study - Attack-rate of tuberculosis among close family contacts of home and sanatorium patients during a 5-years period of following.
2. Role of Diet in the Treatment of Pulmonary Tuberculosis.
3. Isoniazid Study.
4. Studies on the Prevention of Isoniazidinduced peripheral Neuropathy.
5. Thioacetazone study.
6. Intermittent chemotherapy.
7. Role of maintenance chemotherapy in the Prevention of Bacteriological Relapse.
8. Streptomycin plus pyrazinamide.
9. Streptomycin plus PAS.
10. Cycloserine plus Thioacetazone.
11. Cycloserine plus ethionamide.
12. Chemotherapy Studies.
13. Chemoprophylaxis study.
14. Detection of acid-fast bacilli by flure-scence microscopy.
15. Culture for Mycobacterium tuberculosis.
16. Effect of storage of positive cultures on the outcome of streptomycin and isoniazid sensitivity tests.
17. Studies on characteristics of Tubercle Bacilli Virulence.
18. Susceptibility to Hydrogen peroxide.
19. Sensitivity to PAS.
20. Sensitivity to Thioacetazone.
21. Association of Virulence with other characteristics.
22. Identification Tests.
23. Studies on Isoniazid Metabolism - The rate of inactivation of isoniazid, influence of the rate of inactivation on the response to chemotherapy, clinical signizicance of peak serum concentration and duration of intibitory concentration of isoniazid.

24. Investigations on toxicity of Antituberculosis Drugs.
25. Tests for the Detection of Antituberculosis Drugs in urine.
26. Tests for Isoniazid - Combined naphtoquinone-mercuric chloride test, paper test for free isoniazid, Sodium nitroprusside test. The kasik test for isonicotinic acid, Belles and Littleman test for isonicotinic acid, Acetylisoniazid test.
27. Test for pyrazinamide and cycloserine, Test for Ethionamide.
28. Prevalence of Drug Resistance in Tuberculous Patients in Different Parts of India.
29. Investigations under the U.S. Public Health Service Grant Biochemical Studies in Tuberculosis.

PUBLICATIONS:

Total papers published. 62

PLACE IN COUNTRY'S DEVELOPMENT:

The Institute is shedding light on the principles of chemo-therapy, which is of national and international interest.

4. NAME OF THE INSTITUTE VIRUS RESEARCH CENTRE
WELLESLEY ROAD, POONA-1.

NAME OF THE DIRECTOR: Dr. T. Ramachandra Rao

AIMS AND FUNCTIONS:

Study of arthropod borne viruses which are of importance to man.

STAFF:

Scientists and Technologists.	19
Other Technical Staff.	128
Administrative Staff.	51
Total.	198

MAIN DIVISIONS:

1. Division of Virology.
2. Division of Medical Zoology.
3. Division of Field Studies.

In addition to the main laboratory at Poona, there are two well equipped field stations one at Sagar in the Shimoga District in Mysore State and the other at Vellore at Madras State.

MAIN ACHIEVEMENTS:

The Centre has carried out extensive surveys in many parts of India to determine the prevalence of arboviruses and their importance in human health. In addition to the isolation of some previously known viruses, the Centre has also isolated over 16 new viruses. Intense epidemiological studies on Kyasanur Forest Disease, Japanese Encephalitis, Dengue and Chikungunya have been made.

The study of viral diseases of man and animals undertaken have also been responsible for the stimulation of basic studies on medical Zoology. Not only is a good knowledge of the medically important arthropods of the country necessary for understanding the epidemiology of arbovirus diseases but equally important is the study of the mammals and birds some of which act as reservoirs of the virus.

MAIN RESEARCH FACILITIES AND EQUIPMENT:

The Virus Research Centre was established in 1952 as a joint undertaking of the Indian Council of Medical Research and the Rockefeller Foundation. The Centre is very well equipped with all the facilities required for laboratory and field studies. A three-storeyed air-conditioned building was constructed in 1959 by the Indian Council of Medical Research. Plans are under way to construct a modern animal house near Poona.

PUBLICATIONS:

The language of all papers published is English. So far nearly 140 papers have been published by the Centre in leading journals in India and foreign.

PLACE IN COUNTRY'S DEVELOPMENT:

The Virus Research Centre has played an important role in the country's development. The only institution of its kind, wholly devoted to virological research, it has not only contributed new knowledge regarding virus diseases, but also has acted as a training ground to young scientists specialising in virology. The Centre has grown into an internationally known and recognised institution and is designated as a W.H.O. Collaborating Laboratory for arthropodborne virus.

5. NAME OF THE INSTITUTION INDIAN REGISTRY OF PATHOLOGY, SAFDARJUNG HOSPITAL, NEW DELHI-16.

YEAR OF ESTABLISHMENT: 1965

NAME OF THE DIRECTOR: Dr. S. Sriramachari

AIMS AND FUNCTIONS:

The Indian Registry of Pathology is being developed into a service-cum-research organisation fulfilling the following functions:-

1. Collection, classification, duplication and distribution of representative spectrum of histo - pathological teaching material to the several interested medical colleges, institutions and individual pathologists and clinicians.
2. Promotion of a impersonal consultative machinery through the medium of consultant panels for different branches of special pathology. They will help in the verification and classification of all accessioned material and also promote further researches on specific disease entities.
3. Training centre for pathologists, technicians, etc.

PERIPHERAL CENTRES:

1. Bombay.
2. Vellore.

STAFF:

Scientists/Technicians.	4
Other Technical staff.	2
Administrative staff.	2
Total.	8

MAIN ACHIEVEMENTS:

1. Histopathological studies of Hepatic disorders; e.g. Indian Childhood Cirrhosis and Hepatic-Lesions in Tuberculosis; Morphologic Studies of Livers from Cirrhotic adults - autopsy material; on the nature of Hepatic Nuclear Vacuolation in Diabetes Mellitus etc.
2. Studies regarding Neuropathological Problems, e.g. Histopathological Study of muscular dystrophy and related condition; study of acute and chronic extra - dural compression; studies on Experimental Neurolathyrism; effect of Vitamin A analogues on the rat testis, study of brain tumours, study of Muscle pathology study on suspected cases of encephalitis in children etc.
3. Studies in Reproductive Physiology, e.g. IVCD Research programme; effects of Orotic acid on the rat testes etc.
4. Developmental Anamolies of the Skeletal system; e.g. Histochemical study of congenital abnormalities.
5. Biophysical studies in Osteopathology.

RESEARCH FACILITIES AND EQUIPMENTS:

1. Facilities and equipments for photo-micrography.
2. Machinery and electrical equipment needed for the processing of museum specimens.

PLACE IN COUNTRY'S DEVELOPMENT:

For the last several years, pathologists in India, through the forum of the Indian Association of Pathologists, have repeatedly stressed the need for the establishment of organisation for the collection, classification, documentation

and distribution of representative spectrum of histopathological materials that would serve the needs of a large number of teaching institutions in the country, particularly the newer medical colleges. So came the Indian Registry of pathology into existence. This Institution is also acting as a medium of exchange of valuable pathological material. It enables pathologists to have the benefit of the consensus of expert opinion on debatable case material.

VI MINISTRY OF IRRIGATION AND POWER

The Central Water and Power Commission, an attached office under the Ministry of Irrigation and Power is charged with the general responsibility of initiating, co-ordinating and furthering, in consultation with the State Governments concerned, schemes throughout the country for the control, conservation and utilization of water resources for purposed of flood control, irrigation, navigation and water-power generation, as well as schemes of thermal power development, and transmission and utilization of electric energy.

In order to conduct research in the subjects which are its responsibility, the Central Water and Power Commission has established three research organisation and these are:

- (i) Power Research Institute, Bangalore;
- (ii) Central Water and Power Research Station, Poona; and
- (iii) Central Soil Mechanics Research Station, New Delhi.

A brief description of these 3 research institutions is given in the following pages.

1. NAME OF THE INSTITUTION POWER RESEARCH INSTITUTE BANGALORE
YEAR OF ESTABLISHMENT 1960
NAME OF THE DIRECTOR: Shri A.P. Seethapathi

AIMS AND FUNCTIONS:

1. The PRI has as its broad objectives the organisation of research and investigations on diverse problems connected with the generation, transmission and utilisation of electrical power and rendering assistance to the manufacturers of electrical equipment in the country by provision of suitable development and testing facilities.
2. When fully developed it would serve as a national Laboratory for conducting applied research in electric power engineering and directly benefit power supply utilities and electrical industry.

UNITS:

1. Bangalore Unit.
2. Bhopal Unit.

STAFF:

	<u>Bangalore Unit.</u>	<u>Bhopal Unit.</u>
Scientists.	8	1
Engineers.	18	4
Other Technical Staff.	20	11
Administrative Staff.	10	9
Total.	<u>56</u>	<u>25</u>

MAIN DIVISIONS:

1. Power Systems.
2. High Voltage.
3. Short Circuit laboratory.
4. Insulation.
5. Transmission and Distribution.
6. General Engineering.

MAIN ACHIEVEMENTS:

1. Cable fault locator.
2. Suitable insulation coating for indigenous "hot" sticks.
3. Technical reports on digital computer programmes for load flow, three-phase short circuit and line to ground fault studies in interconnected systems.
4. Specimens of ground electrodes embedded in soil subjected to artificial treatment was removed and analysed.
5. A technical report on digital computer programme for design of ground grids in high voltage substations.
6. Testing of insulator strings with the help of impulse generator.
7. A report on lightning arrester field testing kit.
8. Assistance to a few electricity boards in testing and analysing magnetic links affected by lightning strokes.
9. Erection of 50 MVA short circuit generator and ancillary equipment like control boards, field cubicles, control desk, air compressor, circuit breakers etc.
10. Motorette testing with indigenous class "A" insulation.
11. Reports on reclamation of transformer oil using "Korvi" earth and earth obtained from Kashmir.
12. Investigations on the use of indigenous wood in transformer oil.
13. Designs of test-bed and anchor structures for the proto-type tower testing stations and design of the foundation for the anchor structures.
14. Tests in the model tower testing laboratory on a 132 kv double circuit tower model with unstaggered bracing.
15. A technical report on design of transmission towers with digital computers.
16. Study of vibration on transmission line conductors.
17. Investigations regarding the practice of earthing RCC poles carrying over-head lines.
18. Tapping small amounts of power from EHV lines.

19. Use of aluminium in transformers, use of reinforcement rods for earthing.
20. Studies relating to lightning flash counters.
21. Assembly of electronic peak voltmeter.
22. Design of transistorized hot-stick tester, leakage currents in wood poles.
23. Erection of 1250 MVA short circuit generator, super exciter and their auxiliaries.
24. Live-line maintenance of power transmission lines.
25. Testing of materials and equipment for the benefit of various manufacturers.

PLACE IN COUNTRY'S DEVELOPMENT:

The PRI forms part of the Central Water and Power Commission. The necessity to conserve foreign exchange has made it essential to resort to import substitution in the electrical field as far as feasible and the PRI is playing its part in this regard as well. When fully developed the PRI would serve as a national laboratory for conducting applied research in electric power engineering and directly benefit power supply utilities and electrical industry.

2. NAME OF THE INSTITUTION CENTRAL WATER AND POWER RESEARCH STATION,
POONA-24.

YEAR OF ESTABLISHMENT: 1916

NAME OF THE DIRECTOR: Shri C.V. Gole

AIMS AND FUNCTIONS:

Conducting hydraulic research and allied engineering investigations to evolve efficient and economical designs and measures for protection against erosion and flooding, for development and maintenance of water supply, irrigation, power and navigation for ship building and foundation of heavy structures.

The research activities of the Station cover the following fields.

- (a) River Behaviour and Taming.
- (b) Flood Control.
- (c) Hydraulic Structures.
- (d) Maritime Hydraulics.
- (e) Ship Model Testing.

- (f) Radio Isotopes Technique.
- (g) Statistical Analysis.
- (h) Mathematical Aspects.
- (i) Geophysical and Seismological Investigations.
- (j) Experimental Stress Analysis.
- (k) Engineering aspects of soils.
- (l) Testing of Concrete and Construction materials.
- (m) Instrumentation and
- (n) Miscellaneous such as Design of irrigation channels and instrumentation. Refresher courses in hydraulics and Practical demonstrations in Hydraulic Laboratory and the allied subjects of Photoelastic analysis, Geophysical Investigations and Soil Surveys.

STAFF:

Scientists & Technologists. (incl. Civil Engineers)	146
Auxiliary Technical (incl. Workshop)	248
Administrative (incl. Class IV)	225
Total.	619

MAIN DIVISIONS:

1. Rivers and Canals.
2. Flood Control.
3. High Head Structures.
4. Ports and Harbours.
5. Tidal Hydraulics.
6. Ship Model Testing.
7. Instrumentation.
8. Photoelasticity.
9. Soils and Concrete.
10. Chemistry.
11. Physics.
12. Geophysics.
13. Mathematics.
14. Statistics.
15. Computer.
16. Cavitation.
17. Earthquake Engineering.
18. Model Engineering.
19. Rock Mechanics.
20. Hydraulic Analysis and Prototype Testing.

In addition, there are two cells created under CBIP's programme of fundamental research on design of channels and development of instrumentation on all-India basis.

MAIN ACHIEVEMENTS:

The Research Station had its origin more than fifty years ago in 1916 and has numerous achievements to its credit since then. From Sukkur Barrage and Lower Sind Barrage in West Pakistan to Kabo Headworks in Burma, and from Cochin harbour in the south to the Jhelum river in the north are the engineering feats which bear testimony to the role played by this Research Station not only within its campus but also out in the field. The mighty projects such as Bhakra, Chambal, Hirakud, Kosi, Koyna etc, have come up due to its research skill no less than of the design and construction engineers.

The monumental battle of Dibrugarh against the Brahmaputra was successfully fought during the last decade by studying its tactics of attack in its model. The behaviour of the Hooghly is under constant watch in its models to keep the part of Calcutta alive. The usefulness and proper development of other ports including Bombay, Cochin, Kandla, Madras, Paradeep etc. is also being ensured with the aid of models. Radio-isotope technique has been employed in tracking the silt movement in Bombay harbour, Hooghly estuary and a few other places. Some of the principal problems lately subjected to hydraulic model study pertain to Trisuli Barrage (Nepal), Srisaillam Dam, Pong Dam (Beas Project), Ukai Dam, Rajasthan Atomic Power Project, Vishakhapatnam Port, Tuticorin Port, Mormugao Port etc. Structural model tests have been done in respect of Idikki Arch Dam, and similar tests are being done for Boladwadi Multiple-arch Dam (Koyna Project) Designs of boats, launches, tugs, cargo vessels and other craft, such as Satpati fishing boat, Bridge erection boats (for Defence), Dock tug and Pilot launch (Garden Reach Workshops), Akbar Jayanti etc are tested in Ship Model Testing Tank. Prototype tests for observing the performance of sluice gates in dams, hydropower turbines, navigation vessels have been recently done. Several instruments for automation and precision in its various investigations have been developed by the Research Station.

MAIN RESEARCH FACILITIES:

The Research Station with its 20 Divisions has the necessary facilities and equipment for performing the functions enumerated above. Latest techniques are being adopted, and new facilities and equipment added under its expansion schemes from Plan to Plan. Spread over 120

hectares of land excluding staff colony near Khadakwasla Dam, the Research Station has ample potential capacity to meet the demands for hydraulic model research, two-dimensional as well as three-dimensionals. An Indoor Hydraulic Laboratory has been constructed for experimental work of high precision, the main facilities being multi-test water tunnel, tilting flume, wave flume, test flume, high velocity flume, and a small low velocity wind tunnel. The multi-test water tunnel, which is being procured with U.K. assistance, will enable research on cavitation in free surface hydraulic structures, gates valves, outlets, marine propellers, planning boats, underwater missiles, pumps and turbines. Performance characteristics of pumps and turbines will also be studied. A laboratory for calibration of venturimeters, orifice meters, and similar other discharge measuring devices is proposed to be added. The 152.5 m long Ship Model Testing Tank is proposed to be extended by 50% for high speed tests for naval craft. A Coastal Engineering Research Centre is also proposed to be established. Electronic computer facilities are being added; an analogue computer has already been obtained while digital computer is under process of sanction. All the 20 existing Divisions are expected to be well-equipped by the end of Forth Plan. Post-graduate and other training facilities are available at the Research Station.

PUBLICATIONS:

The achievements of the Research Station are published in its annual Research Memoirs. Technical Memorandums on specific topics, and Manuals on 'River Behaviour, Training and Control (Under the auspices of Central Board of Irrigation and Power), 'Stream Gauging' and 'Hydraulics of Stable Channels' are other publications. The language used is english.

PLACE IN COUNTRY'S DEVELOPMENT:

Central Water and Power Research Station is the premier organisation of India for hydraulic and allied engineering research vitally associated with the national efforts to develop the water resources for food production and industrial development, and for transport and shipping, besides attending to some of the Defence needs.

3. NAME OF THE INSTITUTION CENTRAL SOIL MECHANICS RESEARCH STATION,
EXHIBITION GROUNDS, NEW DELHI-1.

YEAR OF ESTABLISHMENT: 1955

NAME OF THE DIRECTOR: Dr. I.C. dos M. Pais-Cuddon

AIMS AND FUNCTIONS:

1. Research and field investigations in soil mechanics, rock mechanics and foundation engineering.
2. Construction material surveys and control tests and physico-chemical analysis of materials.
3. Sedimentation surveys in rivers and streams to determine the storage capacity for reservoirs.
4. Command area soil survey to examine the suitability of land for irrigation and alignment of irrigation canals.
5. Structural analyses.
6. Training in sediment surveys, geophysical surveys, soil mechanics and soil survey testing.

STAFF:

Scientists & Technologists.	29
Auxiliary Technical Staff.	41
Administrative Staff.	13
Total.	33

MAIN DIVISIONS:

1. Soil Mechanics.
2. Concrete and Material Testing.
3. Soil Survey and Chemistry.
4. Silt Investigation.
5. Structures.
6. Museum and Exhibition.

MAIN ACHIEVEMENTS:

1. Studies of foundation pressure in soil overburden done on a large number of dams including Beas Dam, Tawa Dam, Ramganga Dam, Ranapratap Sagar Dam and Ukai Dam.
2. Foundation studies carried out for many heavy structures and buildings, including Janpath Shopping Centre, 'C' Power Station and Hindustan Times Building.
3. Soil survey carried out of the Giri project in Himachal Pradesh and a number of other projects in Madhya Pradesh, Rajasthan, West Bengal, etc.
4. Detailed studies made of laminated and fissured rocks of Ranapratap Sagar Dam and Tawa Project.
5. Evaporation control experiments conducted in Delhi and Andhra Pradesh and areas of acute water scarcity with a view to study the reduction of evaporation losses from reservoirs with the use of the monomolecular film of cetyl-stearyl alcohol.
6. Assisted in setting up the laboratories in Cambodia for the Tonle Sap Project. Planned and executed field investigations and laboratory Testing for the project.

PLACE IN COUNTRY'S DEVELOPMENT:

In order to increase irrigation and power potential in the country, a number of dams and projects have been taken up for execution. Foundation investigations, survey and testing of construction material, silt investigation, command area surveys, etc., have thus become an important area of scientific research. The Central Soil Mechanics Research Station by undertaking all these research activities has an important role in country's development. The Research Station is being developed as an Asian centre for research and co-ordination in soil mechanics and foundation engineering.

VII MINISTRY OF RAILWAYS

The Railway Board functions as a Ministry of the Government of India and exercises all the powers of the Central Government in respect of regulation, construction, maintenance and operation of Railways.

In order to conduct research in the areas of its responsibility, the Railway Board has under it the Research Design and standards organisation.

NAME OF THE INSTITUTE RESEARCH DESIGN & STANDARDS ORGANISATION
LUCKNOW

YEAR OF ESTABLISHMENT: 1957

NAME OF THE DIRECTOR: Shri P.N. Mathur

AIMS AND FUNCTIONS:

1. Undertakes designs and preparation of specifications and drawings in respect of Indian Railway standards for permanent way bridges and structures, rolling stock and in connection with the indigenous development and export promotion of equipment components.
2. Renders all technical advice in respect of standardisation of railway structures, rolling stock and other equipment etc.
3. Is responsible for organising, conducting and coordinating of research, testing and trials required by the Indian Railways.
4. Provides advisory service to the Railway Board, Zonal Railways and Production Units in respect of technical matters.
5. Renders technical assistance in the development of indigenous substitutes and also helps in the development of indigenous capacity for the manufacture of such substitutes.

6. Provides assistance necessary in connection with the design, testing and inspection of railway rolling stock, equipment and materials for export.
7. Undertakes inspection for the production units and manufacturers of railway equipment.
8. Is responsible for service engineering in respect of diesel and electric locomotives.
9. Provides advisory service to the Railway Board, Zonal Railways and Production Units in respect of users' requirements and reactions concerning prototypes and new equipment as well as reactions of users to new ideas in freight handling.
10. Maintains a Central Technical Library and documentation services for the dissemination of technical information among railway technologists.

STAFF:

Scientists and Technologists.	173
Auxiliary Technical Staff.	1099
Administrative Staff.	417
Total	1689

MAIN DIVISIONS:

1. Civil Engineering.
2. Mechanical Engineering.
3. Signal and Telecommunication.
4. Traffic and Transportation.
5. Instrumentation.
6. Architecture.
7. Electrical Engineering.
8. Carriage and Wagon.
9. Motive Power.
10. Metallurgical and Chemical.

MAIN ACHIEVEMENTS:

1. Designs for broad gauge and metre gauge AC electric multiple unit, motor and trailer coaches.
2. Design and development work in connection with the demand for special types of wagon stock, for specific requirements of the industries.
3. Diesellocomotives with 700 HP rating.
4. Equipment consisting of containers, rail flats and special tractor-cum-trailer units.
5. Electrification of Indian Railways at 25KV.
6. Foreign exchange savings through import substitution.
7. A new rail section, weighing 52kg per metre has been evolved.
8. New and economically advantageous designs for bridge structures were prepared.
9. Considerable work has been done on aspects relating to safety, in the operation of trains.
10. Extensive investigations have been undertaken to improve the performance of the vacuum brake both on passenger and goods trains.
11. Investigations have been conducted on the question of loads, stresses and speed effects on track components under dynamic conditions, relating to varying speeds and different types of rolling stock.
12. Detailed research and investigations have been taken up for increase of speeds for mail and express trains on the Broad Gauge from 96 Km/h to 105 Km/h and later to 120 km/h.

MAIN RESEARCH FACILITIES AND EQUIPMENTS:

Extensive mechanical, brake investigation, civil engineering, soil mechanics, signalling and tele-communications, instrumentation and other laboratories with appropriate facilities exist in RDSO.

PUBLICATIONS:

1. Indian Railway Technical Bulletin.
2. Documentation Notes.
3. Annual Reports of RDSO

4. Technical papers.
5. Technical notes.
6. Technical monographs.
7. Reports carried out on items of railway research.
8. Reports of various committees.

PLACE IN COUNTRY'S DEVELOPMENT:

Since its inception, this organisation is chiefly engaged in making available technological data and material, for the development and modernisation of the Indian Railways, for achieving economy and efficiency in construction, maintenance and operation, for reducing dependence on imported "know how" and equipment, and for increasing safety in rail transport.

VIII MINISTRY OF STEEL, MINES AND METALS

The Ministry of Steel, Mines and Metals has under it one scientific research organisation, viz., the Geological Survey of India. A brief description of this organisation is given in the following pages.

In addition, the Indian Bureau of Mines Nagpur, under this Ministry, though mainly responsible for prospecting operations and inspection of mines, undertakes research on mineral conservation and mining methods.

NAME OF THE
INSTITUTION

GEOLOGICAL SURVEY OF INDIA,
27, CHOWRINGHEE ROAD, CALCUTTA-13.

YEAR OF ESTABLISHMENT:

1851

NAME OF THE DIRECTOR GENERAL: Shri G.C. Chatterji

AIMS AND FUNCTIONS:

1. Systematic geological mapping of the country.
2. Regional mineral assessment and exploration.
3. Engineering Geology for the study of dam sites, bridges, tunnels, etc. with special reference to the nature of stability of the foundations and related engineering problems.
4. Groundwater Geology - Systematic study on local and regional scale for locating water supply for domestic, agricultural and industrial purposes.
5. Seismology - Field study of earth-quake data and their interpretation.
6. Preparation of geological and mineral maps and reports on complete surveys and investigations dealing either with a particular region or with a particular mineral in one or more regions.
7. Dissemination of information on geology and minerals.
8. Geological education and training

STAFF:

Scientists & Technologists.	1187
Auxiliary Technical.	2892
Administrative Staff.	1661
Total.	5740

MAIN DIVISIONS:

The following are the main divisions at the head quarters:-

1. Coal Exploration
2. Map Production
3. Geophysical
4. Drilling
5. Central laboratories (petrological, palaeontological and chemical)
6. Publications
7. Technical Administration

In addition, there are four regional offices and nine Circles offices of the Geological Survey of India, located in various States. Each regional office has under it laboratories and Drilling, Geophysical, Engineering Geology and Groundwater Divisions. The Circle offices are provided with small laboratories Drawing Office, Stores, etc.

MAIN ACHIEVEMENTS:

1. Detailed survey of the coalfields such as Raniganj and Jaria, oil fields of India and Burma, Managanese ore deposits, Bausite deposits, etc.
2. Investigation of the Great Assam Earthquake of 1897.
3. Study of the Himalayan glaciers.
4. Mineral explorations by the survey in areas unexplored such as Dheu-Kanal, Keonjhar, Mayurbhanj and Kalahandi districts of Orissa, Kutch, Kangra district, Panna, Alwar, Zawar etc.

6. Experimental mining of the Amjor pyrites deposits.
6. Geophysical studies in the Cambay region.
- 7.. Successful application of geophysical methods for locating hidden manganese deposits in Madhya Pradesh, sulphide ore bodies in Bihar, and Mysore.
- 8.. Research on peralkaline high-level granites and rhyolites of Rajasthan, the funnel - shaped intrusion of anorthosite in Madras, and the pitchstone flows among the Rajmahal plateau basalts...
- 9.. Engineering Geology studies connected with major and minor irrigation schemes, hydroelectric storage and flood control projects.
10. Drilling for coal, base metal ores, gypsum, gold etc.
11. Detailed mapping of iron ore deposits, coal deposits, and many other like bauxite, copper, bentonite, lead etc.
12. Compitation and publication of the regional geological map of Asia and the Far East for the ECAFE.

MAIN RESEARCH FACILITIES AND EQUIPMENT:

The Geological Survey of India has under it a large number of well equipped laboratories to undertake research in the field of geology and mineralogy and advanced geophysical investigation and research.

PUBLICATIONS:

The Geological Survey of India publishes regularly the data on the field and laboratory research and exploration conducted by it in the form of Memoirs, Records, Bulletins and Palaeontologin Indica. Besides, a quarterly semi-technical journal called "Indian Minerals" is published in English.

PLACE IN COUNTRY'S DEVELOPMENT:

The role played by the Geological Survey of India during the three Five Year Plans is indicative of its place in country's development. The activities of the organisation will keep on increasing alongwith industrial and agricultural developments and the technological advances. 22-116